THIRTY-EIGHTH QUARTO VOLUME

From January 1, 1905, to June 30, 1905

RAILROAD GAZETTE

A JOURNAL OF TRANSPORTATION, ENGINEERING AND RAILROAD NEWS

(Established in April, 1856)

FIFTIETH YEAR

NEW YORK - - 83 FULTON STREET

1905

RAILROAD GAZETTE

AN INTERSTATE COMMERCE COURT.

A protest was made in the *Railroad Gazette* of December 16 against that part of the President's message which recommends that rate-making powers should be placed in the hands of the Interstate Commerce Commission. It was argued that this was constitutionally objectionable because of the centralization of tremendous power; politically objectionable because the Commission is a political body, subject to appointment for a definite term and likewise subject to removal, and practically objectionable because the task set for the Commission would be too great for it to perform. No better illustration of this last point can be given than to simply call attention to the large majority of the Commission's decisions which have been overthrown by the court of review when such cases have been appealed. We pointed out that it was idle to belittle the power which it was proposed to give the Commission; that it was at error to consider that its rate-making power would be secondary, and that the fact which must be clearly faced was that the proposed powers would sooner or later become general rate-making powers; for example, when classifications were sued on. Indeed, it is questionable if the Commission could change a single rate, standing alone, without incurring the charge either of class legislation or of preferring one port to another. Suppose a rate on grain for export lower than the present rate, between Chicago and New York, should be ordered; then a clear ground of complaint would lie with the roads doing business between St. Louis and Philadelphia. The mistake must not be made of accepting the fallacy constantly propounded by Mr. E. P. Bacon and his associates, that the proposed powers are anything less than general.

Without dwelling unduly on this side of the subject, which has already been fully exploited, it may be pointed out that a commissioner holding such enormous power could not give a really important decision without jeopardizing his political future, and hence that there would be grave doubts about securing an impartial decision in cases where the circumstances also rendered it an unpopular decision. However high-minded the present commissioners may be in the exercise of their duties, it is clearly asking too much of a political appointee, who holds his position on good behavior, as viewed by the President, to make unpopular decisions—and decisions in favor of the railroad company would usually be unpopular. With regard to the personnel of the Commission, it would be hard indeed to prevent it from becoming, to a greater or less extent, a last resting place for the honored veterans of political service, as witness the most recent appointment to that body. But the case against the President's proposal can perhaps be best summed up in the single statement that it has never before been thought conducive to justice to have the prosecuting attorney act also as judge.

There need be no fear that the Quarles-Cooper bill will be passed in the short term of Congress. Between the adjournment and the session next December there will be time for full discussion of this matter and for a general clarifying of the proposition, which is wholly to be desired, in view of the seeming certainty that some legislation on the subject will be enacted next winter. We are, therefore, confronted with the question of what type of law is most to be desired with regard to railroad rates, in view of the fact that the Government is reasonably certain to take action of one kind or another.

The best opinion at the present time seems to be that Congress should take one of two alternatives; either place an additional United States Circuit Court judge in each of the judicial districts, whose duty it should to try cases sued before him by the Interstate Commerce Commission as prosecuting attorney, or else establish a central court of the same rank as the circuit courts, which should do the same thing. As regards the respective merits of the two plans there is some difference of opinion, and both plans are open to objections, but they seem to afford a better way out of the difficulty than any other measure which has been suggested.

The primary advantage of a court made up of an additional judge, perhaps with two or three assistants, in each judicial district, would be that the trying of cases brought by the Commission would be greatly expedited. There is no use in ignoring that delay of justice works in favor of the defendant railroad companies during the prosecution and trial of cases through successive appeals, and that this injustice to the complainant shippers has again and again served to deter them from using their remedy for undoubted wrongs. This is what adds the mainstay of strength to the proposition that the Commission should make the rates pending appeal, and if a protest is made against conferring this highly dangerous and inequitable power on the Commission it must be an intelligent protest, with clear understanding of the real wrongs arising from the delays to which the complainant is at present subject when he protests against transportation charges.

Another advantage of the increased circuit court plan lies in the fact that the judge of each judicial district would be presumed to have more information about the transportation situation in his local territory than would a judge in a central court. To offset this advantage, it is claimed by many that a local judge would have prejudices, and would be subject unconsciously to pressure which would make it hard for him to give an equitable award in important questions. To this objection it can only be answered that the conservation of all citizens' rights under the Constitution must presuppose and be dependent upon honest courts of appeal, and that the life-tenure of the judicial office removes the incentive, otherwise tremendously strong, to trim decisions to the wind. The advantages of the enlarged circuit court over the central court seem to lie mainly under two heads; first, and most important, the expedition of justice, and, second, the better knowledge of local conditions. It is greatly to be feared that a central court, unless subdivided into independent parts, would become so congested with work that the old evil of the law's delay would again become prominent.

There is a strong belief in some quarters that no legislation at all should be undertaken with regard to the rate situation, and the argument is advanced that an Interstate Commerce court would not have enough to do. It is pointed out that only 453 cases have been brought before the Commission in 17 years, and that if all of these had been appealed to the courts, instead of about one-tenth of them, the judges would still have had so much time on their hands that they would have been impelled by the watchful being who is supposed to find mischief for idle hands, to seek increased jurisdiction. But if the Commission, instead of devoting the majority of its time to finding arguments for rate-making powers, should become an active and intelligent prosecutor in the public interest and follow up private car abuses and the inequitable traffic situations of all sorts which are constantly arising in one part of the country or another, it is reasonable to suppose that it could find enough to do to keep the courts busy; while if the courts were composed of the high-minded judges we are accustomed to find in the Government circuits, they could surely be relied upon to perform disinterested service.

Besides the expediting of justice, the other feature about these proposed courts which differs from the present system is that they should be expected, after investigation by the Commission and judicial review, to name a rate, but that if appeal were taken from this rate, the matter should be *in statu quo* until the final decision was reached The withholding of the court's rate from going into effect until the appeal had been settled would be simply the ordinary judicial procedure as applied to all other cases, and with reasonable assurance of a prompt hearing this would be far more equitable than the innocent looking but highly revolutionary proposal that the new rate should go at once into effect, and remain valid until the highest court should order otherwise. This is what constitutes the real difference between general rate-making and rate supervision, and it is certain that after the court had named an equitable rate, the railroads would have little disposition to carry it through to the Supreme Court on appeal.

To sum up, it does not appear that an extended system of special courts to try cases brought by the Commission would work any economic injury, and it is quite believable that such courts might do much good. What is highly important is that the present belligerent spirit of the Interstate Commerce Commission should be rebuked by the universal understanding of the fact that this partisan attitude is one of the most clearly manifest arguments against placing in its hands the dangerous power which it so ardently desires.

AUTOMATIC BLOCK SIGNALING ON SINGLE TRACK.

In another column we reprint some rules recently issued by the Missouri Pacific to govern the operation and use of automatic block signals on single track. This company has lately put in use its first automatic signals and the rules are the result, no doubt,

of careful study of the conditions under which trains have to be run, as well as of the way in which such signals are worked on other roads. We find a lot of fault with these rules. We do not criticise the practice under them, for phrases like that in Rule 707—"unless otherwise provided"—warn the outsider that he may be ignorant of important modifications which do not appear in the book; still less do we single out the Missouri Pacific Company, or its officers, for criticism, for their practice is, no doubt, as correct and intelligent as that of other roads using automatics on single track. Quite likely it may be better than that of other roads, for the company had the opportunity to avoid the mistakes of the others. But taking the rules on their merits, a very brief consideration of their bearing on either scientific signaling, or on good discipline with trainmen, is enough to show the need of settling the question which was raised by the Morrison Committee of the Railway Signaling Association when it declared definitely that automatic block signals ought not to be used on single track. Here is an example of practice, a new installation showing that automatic signals are by this road approved for use on single track. The committee took an opposite view. Which of the two views is the sound one? Where automatic block signals are used as an adjunct to the time-interval-and-despatcher system of running trains the whole question of their cost and of regulations, discipline and safety is quite different from the same question under block signaling as it is generally understood—where it is the one and only means of spacing trains. Therefore it is desirable to have the two questions clearly differentiated. In the early days automatics on double track were treated in the same way that they are to-day on single track; that is, as an adjunct to the time interval; but after long years it slowly dawned on the minds of those who managed them that if the signals were worth anything they ought to be worth more; if they provided a useful rear protection, that protection ought to be availed of. Gradually therefore the time interval was reduced from ten minutes down to three, and the signals were allowed to fulfil their long neglected function of increasing the capacity of the road. If automatic signals are to be a permanent and generally used fixture on single track roads, we may expect to see there a similar development of the lessons of experience; but why should the development be so slow?

Perhaps the most vicious rules to be found in any code are those which can be easily obeyed a part of the time, but which everybody knows are glaringly disobeyed some of the time. A shining example of this kind of rule is No. 714 in the code under consideration. This and the exception in Rule 710b constitute a frank avowal that in time of fog or snow-storm the signals are not intended to either expedite or safeguard trains. But the time when the view is obscured is just the time that fixed signals are most needed. Has any one ever known of an engineman of a fast train who consistently reduced his speed at every signal under such circumstances? The only way to provide for speed at all times is to have distant signals; and with these provided, Rule 714 is, of course, absurd.

Rule 716 embodies in words a principle in single-track blocking that usually goes unformulated; the principle that "under control" has a meaning quite different from that which it has in double-track signaling. But how is this difference to be measured? It cannot be that the speed should be only one-tenth that prescribed in Rule 717, as might seem to be indicated by the difference between the prescribed time in the two rules. Rather the intention seems to be to have the train wait long enough to let the opposing train, if there be one in the block, come through. But if the opposing train has once entered the block under a clear signal, it has (or should have) the right to run through, at full speed, for an unlimited time. If after running one mile in a three-mile block it should stop an hour it could then go on at full speed, could it not? The Missouri Pacific provides for this contingency by Rule 721; but it seems to us that the existence of this rule betrays the most serious weakness in the whole code. This rule, with Rule 716, is the safeguard relied on to provide for all failures of apparatus (Failures of the "system" according to these rules); but rules which leave it to trainmen to decide what is an unusual stop, and to measure such narrow time limits as two minutes, are the kind which in all past experience have made trouble; and to successfully use such rules one ought to have a very high class of conductors, enginemen and brakemen. It may be said that at least these rules would, combined, prevent collisions at high speed; but collisions at very low speed are, of course, a disgrace to any railroad, as well as to any scheme of signaling which is in any degree responsible for them. By the use of Rules 716 and 721 the Missouri Pacific avoids the necessity of carrying velocipedes in the baggage cars of passenger trains for use in flagging ahead, as is done on other block-signaled single-track lines. These other lines have a rule that trains must not pass a stop signal unless preceded by a flagman. The flagging rule seems safe (except to the man riding the velocipede around a curve in the face of a fast passenger train) whatever may be said about its effect in causing delays or in making discipline difficult. For a satisfactory comparison between this plan and that of the Missouri Pacific we shall have to wait until the men experienced in the respective methods compare their notes and publish the results of the comparison.

Another of those rules which are not regularly obeyed is that numbered 718. Rule 99 says that the flagman must go back if the circumstances are such that his train may be overtaken by another; but if automatic signals are in use and properly working he may fairly decide that the circumstances are always such that he will not be overtaken and therefore need not go back at all. But, whether we sophisticate over this rule much or little, it is generally known that brakemen very often omit the flagging where block signals are in use, and so it is at least a fair question whether such a rule has any place in a block signal code. It is true that this criticism is based partly on the inadequacy of the flagging rule in itself, whether used with the block system or without it; but as the rule is harder to enforce with block signals than without, the criticism is by so much the more weighty. Of course, if a flagman does carry out the full precautions, according to the strict construction that superintendents are likely to put upon Rule 99 after a collision has occurred, he is going to be all the time putting down torpedoes and so will delay his train very frequently; so that the immediate question to be asked concerning Rule 718 is, Shall we tolerate numerous delays or shall we consent to lax execution of the rule? From the testimony of conservative superintendents it seems quite certain that this alternative is unavoidable.

One of the rules in this code, No. 730, has a clause which is highly commendable. It requires the trainmen (back of the engine) to observe signals as the train passes them. If trainmen are not so engrossed with their other duties as to prevent them from looking at signals on the left of the train, after passing the signal, the fact would seem to indicate that the conductor or tail-end man might reasonably be required to observe the signals on the right hand—those set at STOP by their own train. Such observation is a necessary element in correct signaling, for with automatic signal arms moving to the stop position after the engine passes them (as is the case with many hundreds of signals), the usual practice, of having no observer except on the engine, leaves the question whether the train is actually protected always open, unless some one on the train has accidentally observed the signal and remembers what its indication was. Some rule-books have a vague requirement that trainmen must observe signals; but, like the rule requiring firemen to keep a lookout, it usually goes unenforced; or, at least, we have not found any case where it was enforced at all systematically. This Missouri Pacific rule, however, seems to be designed to be obeyed. Enforcing it in regard to signals for both directions may not be easy, and the earnest asseveration that it cannot be enforced, and is not worth while, may confidently be expected from some quarter or other; but the superintendent who shall thoroughly test the matter, and remove the obstacles, if serious ones be found, will do the railroads of the country a marked service.

The Outlook for 1905.

The following replies have been selected from a large number of letters received from railroad presidents and managers in answer to an inquiry about the business conditions of the territory through which their respective roads passed as compared with those existing at the same time last year and the year before. To secure this information letters were sent to all the large railroads in the country and many of the smaller ones as well, and the replies printed herewith were selected as representative of characteristic conditions in different parts of the country. In order to secure frank statements and discussions of the situation it was agreed that no names would be printed; therefore the quotations are signed with the title of the answerer but not with his name.

The East.—"My impression of the business conditions in the territory served by this railroad as compared with those of a year ago is that they are better, but not so good as the previous year, which was altogether a phenomenal year."

———, PRESIDENT.

"Business conditions in the territory through which our road passes and which

it and its connections serve are very satisfactory and most encouraging for the future. Our present business and the outlook for next year is substantially better than at the same time last year and fully equal to what it was at the close of the year 1902."
————, PRESIDENT.

Central States.—"The advance in iron and coke has stimulated traffic in a marked degree and our tonnage is increasing fully 25 per cent. in these commodities. The outlook for the next six months is certainly as favorable as it was two years ago."
————, PRESIDENT.

"The business prospects for the coming year are reasonably good in this territory. We expect to make liberal expenditures for construction and equipment work, but nothing unusual." ————, ASST. TO GEN. MGR.

'As compared with one year ago the industrial conditions and prospects are steadily improving and we anticipate that very much better conditions will exist during 1905 than have existed during 1904, when the condition of the industrial plants served by our road was constantly getting worse, until within comparatively recently."
————, PRESIDENT.

Central West.—"The business conditions through the territory where this road runs are better than they were last year, or even the year before, for the reason that we have better farm crops the whole length of the line." ————, PRESIDENT.

"While the volume of traffic is perhaps not quite as large as it was a year ago at this time the spirit that pervades all interests seems to be of such a character that I am confident that in the near future the situation will be all that could reasonably be desired. It seems to me that a great revulsion of feeling has occurred in the business world since the election."
————, PRESIDENT.

The West.—"My impression of the business conditions of the territory through which this road passes as compared with those at the same time last year and the year before is that they are essentially about the same. There has been a shortage in the wheat crop which is quite compensated for, so far as the farmers are concerned, by the obtaining of a much higher price. In other respects the crops are as good as, or better than, those of last year or the year before, and I see no reason to anticipate any decrease in earnings. . . . We have some new work in prospect as well as the purchase of some equipment, but we are very reluctant to go into the matter under existing prices. We regard the price of rails particularly as being exorbitant, and this is true in a large degree as to iron products generally." ————, PRESIDENT.

"The prospects in our territory are for good traffic. We are just beginning to move a very large corn crop and we have no reason to doubt a fair crop of wheat next summer. People generally throughout our territory are in good spirits and are beginning to buy a little more freely."
————, PRESIDENT.

The South.—"There has been a long and serious depression in the iron business, causing the shutting down of many furnaces and curtailing the shipments of material and product from that industry. Indications now are that there will be a revival of this business which will materially affect the earnings in the territory through which this road passes." ————, PRESIDENT.

"The business conditions of the territory reached by this railroad are better than they have ever been and the outlook for the coming year is more favorable than for any previous year in the history of the road. There are several reasons for this. . . . The cotton crop for the present season has been unusually large and the planters, after having paid all of their debts have very considerable quantities of cotton still unsold and unpledged. . . . This condition of prosperity has been emphasized by the increasing number of small industries built within the last year or so and now building at different points on the road. . . . While the conditions along the line of our road are unusually prosperous, yet to a certain extent this condition prevails over the entire South throughout the cotton belt."
————, PRESIDENT.

"It is my impression that the business conditions for the next 12 months are excellent. At the present time the demand for transportation in our territory is in excess of what the company can readily supply." ————, PRESIDENT.

"The business condition of the territory through which our line passes is much improved over a year ago. The activity in the iron business will unquestionably have a beneficial effect upon our earnings for 1905."
————, VICE-PRES. & GEN. MGR.

"The indications for business in this territory for the next year are exceedingly bright. Our own opinion is that 1905 business will be better than 1904 and up to the standard of 1903, which was the high water mark for this company."
————, GENERAL MANAGER.

The Southwest.—"The business conditions of the territory traversed by this railroad are better this year than last, and, indeed, better than in any previous year within my knowledge." ————, PRESIDENT.

"My impression of the business conditions of the territory through which our road passes is that the prospects for business are much more favorable than they were last year, or any previous year. . . . The indications are that the improvement in earnings will continue through the fiscal year; that is, until the 30th of June, 1905; after which it will depend upon cotton prospects for another season."
————, VICE-PRES. & GEN. MGR.

The Northwest.—"We are pleased to say that it is our opinion that the business conditions of the territory through which our road passes are greatly improved over those prevailing at the same time last year or the year before." ————, PRESIDENT.

Canada.—"The general business conditions in this part of the country are all that could be desired. We have just passed through a season of exceptionally heavy crops and consequently the farming public is prosperous, and all other classes of industry are equally so; therefore, we will have a very large increase in 1905 over 1904." ————, GENERAL MANAGER.

"We expect a moderate increase in next year's business over the business of the two preceding years, following upon the re-opening of industries which during a certain part of 1904 were closed."
————, GENERAL MANAGER.

Mexico.—"The prospects and business outlook for 1905 are very encouraging. The crops are promising and the indications are that the mineral development will very largely increase and impetus will be given to this enterprise on account of the recent action of the government looking towards fixing the value of the Mexican dollar at 50 cents gold. This will give confidence to foreign investors, and we anticipate a very large influx of foreign capital for the purpose of developing the resources of the country in every direction." ————, PRESIDENT.

A collection of scattered opinions of this sort has no great intrinsic value, but it has a certain comparative value when set beside the returns for other years. It will be recollected that in the statements printed in the *Railroad Gazette* Jan. 8, 1904, the general feeling was distinctly pessimistic and great reluctance was shown towards beginning new work. How prophetic this was of the future is best grasped by reference to the figures for new mileage and for car and locomotive output published within the last few weeks. Without making a statistical collaboration, it may be said in general that the railroad officers sending answers to the current inquiry are almost, although not quite, unanimous in saying that they expect to do at least the normal amount of betterment work during the coming year, while a few have outlined a programme of unusually heavy expenditure, which was held up in 1904. The opinion expressed above by one of the writers that current prices, particularly of iron and steel, are too high, is repeated in one form or another in a considerable number of the letters at hand.

A Phase of Eminent Domain.

Some nine months ago we had occasion to point out the somewhat exceptional importance of a suit brought in the Connecticut courts to condemn a minority holding of railroad stock. Described in as brief words as possible, the New York, New Haven & Hartford Company brought suit against C. K. Offield, of Chicago, the holder of two remainder shares of the New Haven & Derby Railroad Company, a short but valuable subsidiary line leased at 4 per cent. on the stock to the plaintiff corporation, which owns 4,468 shares out of a total of 4,470. The suit was brought under a comparatively new statute of the state passed in 1895 and not until now brought to a legal test. This law provides that a railroad corporation acquiring more than three-fourths of the stock of any steamboat, ferry, bridge, wharf or other railroad corporation may acquire also the minority shares, if a Superior Court Judge finds it "for the public interest," at a value to be fixed by three appraisers. There are other features of the law but the foregoing is its substance. The defendant made a vain attempt to get the case transferred to the Federal courts before its adjudication by the courts of Connecticut. On demurrer and reservation the suit went up to the highest tribunal of the state which has just found for the plaintiff.

For several reasons the decision is of legal moment. The rapid consolidation of railroads in this country is leaving a larger and larger number of minority groups of shareholders whose relations to "the control" is of growing interest to both parties. Secondly, the decisions of various state tribunals are not many in number and vary considerably in scope, application and even in principle. Thirdly, the so-called "public interest" in condemnation of personal property remains a somewhat vague and undefined and a special rather than general proposition. But, quite apart from such considerations, the sweeping quality of this new Connecticut decision gives it an importance of its own, especially as in the opinion all the five judges of the court concurred.

The court finds (1) that the general and settled policy of Connecticut as expressed in legislation is to allow the consolidation of connecting railroads under one management; (2) that a definite public interest exists that improvements of every kind should

be financed as cheaply as possible, as in the end they will then cost the traveling and freighting public less; (3) that in the case in court the New Haven & Derby Railroad, as a limited and subsidiary property, could not obtain the loans for large projected improvements, or, if obtaining them, would have to pay a higher rate of interest than would the plaintiff corporation—the higher rate ultimately becoming a public burden; (4) that the New Haven & Derby corporation has become a "mere shell," the survival of which can have no useful purpose and the complete extinction of which serves a public end; (5) that there is no grant of exclusive privileges, and that "railroad companies constitute a peculiar class of artificial persons which can properly be invested with special privileges of a kind calculated to promote the public good"; (6) the condemnation and appraisal are not deprivation of property without due process of law; and (7) do not impair the obligation of contract, as the defendant acquired his shares subject to a public trust.

The points of the opinion as thus condensed show at a glance its sweeping character. We quote, as further illustration, two of its sentences.

The plaintiff's railroad is a great highway for public use. Every improvement upon it furthers the public use, and, the more economically it is made, provided it is well made, the more is such use promoted, because it will cost the public less.

The words "every improvement" as a suggested sanction for the exercise of the power of eminent domain certainly push that idea further than any judicial decision which we have read. It is not a long stretch to make them cover every branch and detail of railroad "improvement," financial as well as physical, and run perilously near to confusing mere corporative convenience with public necessity.

The sovereign power of eminent domain in a state legislature is, of course, a fundamental one and its reach large, subject only to constitutional limitations. It applies, beyond any legal doubt, to personality as well as to reality. But the legal as well as laical opinion certainly has prevailed that, in the case of personality at least, it should be exercised with extreme caution; that the public interest should be clear, positive, fairly immediate and not inferential; and that it should not be exercised in any sense to increase corporative power already ample practically for the particular public service. Applying the latter test one is tempted to inquire how the New Haven Company, owning absolutely all but two shares of the subsidiary road's stock and able also to throw its own high credit in the scale could not have accomplished its scheme of western extension and improvement without added "public burden" as expressed in a higher interest rate on loans. Again, at what point does the acquisition of majority shares reduce the minority interest to the "mere shell" which public policy requires should be crushed? Is it not quite conceivable that a minority interest, albeit small, may represent both personal equities and a valid principle? But these are, in the main, questions for the lawyers. The fact stands that the Connecticut Supreme Court, taking, in its own words the policy of the state legislature "while not absolutely conclusive upon the judicial department" as "entitled to very great weight" has rendered a decision which, unless reversed by Federal judges, cuts the ground away from minority holders of less than one-quarter of the shares in the corporations to which the statute applies. It is one of several more or less divergent rulings in various states which, it is to be hoped, the United States Supreme Court will ere long clarify.

It should be added that, in this particular case, the defendant demanded $2,000 a share for his stock. How far this prejudiced his case—for judges are but human—we do not know. But it suggests the broader phases of the subject as they present themselves, bed-rocked in the equities, to the layman, the investor and the official railroad financier. There is, on the one hand, the wrong of the so-called "freezeout" by the majority interest and, on the other, the so-called "strike" by a small minority interest taking advantage of an artificial and obstructive position. Between these two extremes of evil there are all sorts of equities both in degree and kind. Ideal justice would probably have to take each case by itself and specialize rather than generalize. In the necessary absence of such idealizing with legislative and judicial, the law must take as its maxim *in medio tutissimus ibis* and steer some midway course between the two vicious alternatives. To formulate such a statute may be difficult, but, after legal precedents and experiences have crystalized, not impossible.

Northern Securities Injunction Dissolved.

On January 3d the United States Circuit Court of Appeals handed down a decision in the Northern Securities injunction case setting aside the temporary injunction restraining James J. Hill of the Great Northern, and J. P. Morgan from distributing on a pro rata basis the Northern Pacific stock which was put into the Northern Securities Company. It will be recalled that E. H. Harriman placed a controlling interest of Northern Pacific stock in the Northern Securities combination and that when the company was declared illegal he desired to receive back again, in the stock distribution, this majority control. The Great Northern interest, on the other hand, contended that the Northern Securities Company was not acting in the capacity of a trustee but that it was an actual owner and that when its affairs were liquidated the creditors were entitled to a pro rata distribution of the entire assets. This plan, of course, gave Mr. Harriman a large minority holding of Great Northern which he did not before possess, but took away from him the control of Northern Pacific with which he went into the combination. The case was heard by Judges Acheson, Dallas and Gray at Philadelphia. The opinion was written by Judge Dallas with Judge Gray dissenting.

In his opinion Judge Dallas said that he understood that the learned judge in the lower court was influenced in granting the injunction by the serious and doubtful nature of the questions involved, and desired to so place the matter that it would be subject to review. The injunction complained of precluded the enjoyment of rights of ownership in property of great value. The facts upon which the propriety of upholding it depended were unquestionably disclosed in the record, and the principles by which the legality of the order awarding it had to be tested were indubitable and might be as readily applied now as at any other time. The appellees (E. H. Harriman, et al.) contended that the shares of railroad stock in question were acquired by the Securities Company subject to an alleged agreement in accordance with which the Securities Company would hold them as custodian, depository, or trustee, and that the legal and equitable owners of the shares were and are the several parties who originally exchanged the same for stock of the Northern Securities Company. On the other hand, the appellant, the Northern Securities Company, insisted that it acquired the railroad shares referred to by absolute purchase and that consequently it holds the equitable as well as the legal right to them. Judge Dallas bases his decision on the opinion that the transaction, at least in form, and *prima facie* in substance, was one of purchase and sale. He holds that the resolution which authorized the acquisition of the railroad stock on behalf of the Securities Company was adopted by its Board of Trustees at a meeting at which Mr. Harriman was present as a member of the board, and the only authority it conferred was to purchase the stock at the aggregate price of $91,407,500, of which $82,491,871 was payable in the fully paid up and non-assessable shares of capital stock of the company at par, and $8,915,629 was payable in cash. Judge Dallas maintains that the railroad shares were unconditionally assigned to the Securities Company; that the price specified in the resolution was paid by it, and that no sufficient evidence has been produced to establish the existence of the agreement alleged by Harriman and his associates.

It is thought likely that an appeal will be taken before the Supreme Court. In this case a curious situation will come up, which has previously been commented on in the *Railroad Gazette;* for the Supreme Court, whichever way it decides, will apparently be forced to fortify a combination of parallel and competing lines in restraint of trade, as viewed by the Sherman act. If it sustains Hill, control of the Northern Pacific will lie with the Great Northern. If it sustains Harriman, the control will lie with the Union Pacific. It would seem that the ultimate decision must bring out a strong argument as to the utter impracticability of definitely and conclusively enforcing the Sherman act in its present form.

Reports published in New York this week indicate that the prolonged contest between rival companies for the right to build a four-track passenger railroad from the Harlem River, New York City, northeastward through the Borough of the Bronx and the county of Westchester to the Connecticut line is to result in the building of lines by both companies. At any rate, both now give evidence of strong backing and both make announcements indicating a purpose to prosecute their respective enterprises with persistence and energy. The company which has been longest in the public eye, the New York & Port Chester, has until quite recently found difficulty in convincing the public that it had substantial backing; but it is now announced that a construction company has been incorporated for the purpose of building the road, and the list of its directors includes such strong names as Edwin Gould, Charles W. Morse, George R. Sheldon and Henry F. Shoemaker. The other company, the New York, Westchester & Boston, has only appeared within the last year—since the New York & Port Chester seemed destined to lose its rights by reason of the obstinate attitude of the Board of Aldermen of New York City; but from the first it had the names of well-known financiers in its list of directors, and the principal question in the minds of the public was whether the purpose of the company was to actually build a railroad, or, in the interest of some other road or party, to merely prevent the construction of any road. This question seems now to be solved by the announcement that General William Barclay Parsons has been engaged as Consulting Engineer and that Mr. W. A. Pratt, late Chief Engineer of the Staten Island Rapid Transit Road, has been engaged as Chief Engineer.

We have already reported (Dec. 23) the decision of the United States Supreme Court in the Johnson coupler case, holding that

the law forbids all attempts to couple one car to another except by automatic couplers—which couplers, of course, must be in good working order. As it is already well settled that any difficulty in uncoupling—such as that due to a bent uncoupling lever, a lifting chain that is too long, or a pin that sticks—makes the railroad company liable for damages to any brakeman injured by going between the cars under almost any circumstances that can be imagined, the present decision would seem to leave us with a pretty rigid statute. There is no way to comply with it except by maintaining at a very high standard the whole of the repair and inspection departments. Freight cars will need as careful attention as passenger. The full text of the decision, now at hand, does, however, show one feature that did not appear in the telegraphic reports, and that is in regard to contributory negligence. On this point Chief Justice Fuller says, briefly,

> Finally, it is argued that Johnson was guilty of such contributory negligence as to defeat recovery, and that, therefore, the judgment should be affirmed. But the Circuit Court of Appeals did not consider this question, nor apparently did the Circuit Court, and we do not feel constrained to inquire whether it could have been open under § 8, or, if so, whether it should have been left to the jury under proper instructions.

Whether this will lead to new complications on the next trial it is impossible to say. From the layman's standpoint it would seem that cases might often hinge on the skill and care of the brakeman. We can imagine that Johnson was a skilful trainman and did his best to couple a Miller and a Janney, with the most suitable link and pins available; or, on the other hand, that he was heedless or bungling and devoid of common ingenuity. But lawyers, not laymen, will probably settle this question.

Another point of interest is that wherein the Court decides that the interstate dining car, when on the side track, between trips, is to be treated as still engaged in interstate commerce. Here, as in the other principal questions, the court takes the common sense view of the meaning of the statute, and refuses to split hairs; but it leaves some room for hair splitting in future cases, as will be seen by the following:

> The dining car had been constantly used for several years to furnish meals to passengers between San Francisco and Ogden, and for no other purpose. On the day of the accident the eastbound train was so late that it was found that the car could not reach Ogden in time to return on the next westbound train according to intention, and it was therefore dropped off at Promontory to be picked up by that train as it came along that evening. The presumption is that it was stocked for the return, and as it was not a new car, or a car just from the repair shop, on its way to its field of labor, it was not "an empty," as that term is sometimes used. Besides, whether cars are empty or loaded, the danger to employees is practically the same, and we agree with the observation of District Judge Shiras in *Voelker v. Railway Company* [concerning a freight car in a yard], 116 Fed. Rep. 867, that "it cannot be true that on the eastern trip the provisions of the act of Congress would be binding upon the company, because the cars were loaded, but would not be binding upon the return trip, because the cars are empty." Counsel urges that the character of the dining car at Promontory was local only, and could not be changed until the car was actually engaged in interstate movement or being put into a train for such use. . . . Confessedly, this dining car was under the control of Congress while in the act of making its interstate journey, and in our judgment it was equally so when waiting for the train to be made up for the next trip. It was being regularly used in the movement of interstate traffic and so within the law.

For the status of a dining car not stocked, or one stocked with bread and whisky, but not with meats and ice cream; or of a freight car or a sleeping car going to or from the shop; or of a dining car that gets mixed, on the side track, with some other dining cars which are not interstate, we must wait till the next lawsuit comes up for decision. But sufficient unto the day is the evil thereof. We need not further speculate concerning the future; for it is given out at Washington that the Administration is now going to vigorously prosecute violations of the coupler law wherever found.

The executive committee of the American Railway Appliance Exhibition, to be held in Washington, D. C., next May in connection with the International Railway Congress, has been active in its efforts to obtain the passage by the House of Representatives of the necessary resolution authorizing the Secretary of War to permit the exhibition to use what is known as the White Lot for the exhibits. The Senate passed the resolution unanimously when it first came up, three or four days after the opening of Congress. In the House, one member objected to its passage and succeeded, single-handed, in delaying its final adoption. The resolution will come up in the House again on January 9, and its friends are hopeful of its success. In the meantime, the executive committee has been sending to every member of the House a personal appeal setting forth the benefits to be derived from such an exhibition, together with answers to every apparent objection which might be made to it. The holding of such an exhibition means much to American manufacturers and at the same time would be a liberal education to every foreign railroad officer who attends the Railway Congress. It is greatly to be desired that the enabling resolution should be passed without further delay.

The contributor who calls attention, in another column, to the high percentage of trespassers that figure in the annual accident records, has touched upon a cause of much unnecessary death and suffering. Entirely apart from the deaf men who make a daily thoroughfare of the railroad track, running on regular schedules and ignoring the possibility of specials, the number of tramps and of children who are killed or injured by being where they have no right to be is appalling. Whether precepts from the parent, pastor or schoolmaster would tend to keep children off the tracks or would have an effect like that of teaching a parrot what not to say, is hard to predict. Children, like corporations, are prone to classify all laws into two broad divisions; of those that have to be obeyed and those that do not have to be obeyed. But that the police and officers of public safety and protection in general should be watchful and deal harshly with trespassers on the railroad, is perfectly feasible, without additional legislation.

NEW PUBLICATIONS.

Letters from an Old Railway Official. By Charles D. Hine, with a postscript by Frank H. Spearman. Cloth; 5 x 7½ in.; 180 pages. Price $1.50. Published by The Railway Age, Chicago. 1904.

Mr. Hine's thoroughly readable little book will be appreciated not only by railroad men but by all those who come into any sort of contact with railroads in their daily lives—and who does not! The old official who is presumed to be writing these letters to his son, now in the position of Division Superintendent, has practical suggestions for all kinds of practical troubles in running a division, and, incidentally, a railroad. The tone of the letters is at once sound and broad, and the discussion is taken out of the plane of makeshift expediency and deals with the principles of sound judgment and of human nature, which are fundamental at all seasons. Besides practical hints of the greatest value to young railroad men, which follow each other thick and fast, the style is so fresh and the problems dealt with are so real that these letters can freely be guaranteed to interest whoever picks them up.

Proceedings of the Twelfth Annual Convention of the National Railroad Master Blacksmiths' Association. Edited by the Secretary, A. L. Woodworth. Lima, Ohio, 1904. 230 pages.

The twelfth annual convention of this association was held at Indianapolis, Ind., August 16 to 18, and was one of the most successful yet held. The subjects considered in the papers and discussions were more comprehensive than ever before, and this volume of the proceedings contains much useful information to the practical blacksmith.

TRADE CATALOGUES.

Hotels and Winter Resorts.—The New York Central & Hudson River Railroad sends its "Four-Track Series" No. 5 bearing the title "America's Winter Resorts." It contains a map of the entire United States, a portion of Mexico, and Central America, as far as the Panama Canal. Sections of the Panama and Nicaraguan Canals are also shown, as well as a map of the Hawaiian Islands, and an outline map of North and South America, including the West Indies. There is also a map of the Pacific Ocean, including various American routes from the United States to Australia, New Zealand, the East Indian Islands, the Philippines, Japan and China, with a large amount of information in regard to winter resorts to visit, with the rates one way and round trip, and a brief description of some of the principal points.

Concrete.—The cement department of the Illinois Steel Company has had reprinted in pamphlet form the chapters on facing and finishing exposed concrete surfaces in the recent book on Reinforced Concrete by Buel & Hill. The pamphlet is of value to contractors and users of concrete because it gives practical hints about doing this class of work.

CONTRIBUTIONS

Accident Record—Correction.

Atlanta, Knoxville & Northern Ry.,
Blue Ridge, Ga., Dec. 31, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of December 23 you report that on the "Atlanta, Knoxville & Northern at Ball Ground, Ga., a freight train was derailed on a trestle bridge and fell into a pond; two men were killed and three were injured." This accident did not happen on the tracks of the Atlanta, Knoxville & Northern Railway, but on a short railroad belonging to the Atlanta Marble Company at Ball Ground, Ga. Our company has nothing whatever to do with the maintenance or operation of the marble company's track.

C. W. BRADSHAW, *Superintendent.*

Accidents to Trespassers.

TO THE EDITOR OF THE RAILROAD GAZETTE:

For the ten years ending June 30, 1903, there were 41,534 trespassers killed, and 46,824 trespassers injured, making a total of 88,358, on the steam railroads in this

country. This is equal to 56 per cent. of all persons killed, and 10 per cent. of all persons injured. For the year ending June 30, 1903, the number of such cases was 10,079, of which 5,000 resulted in the death of the injured person, an increase of 14 per cent. in the deaths and 5 per cent. in the injuries over those reported in 1902, as shown by the statistics published by the Interstate Commerce Commission.

In England, Scotland, Ireland and Wales, with nearly one-half of our train mileage and a much denser population, but where they not only have laws prohibiting trespassing on the tracks and cars but enforce them, during the same ten years, as shown by the report made by the Board of Trade to Parliament, 2,808 trespassers were killed, and 1,378 trespassers were injured, making a total of 4,186. For the year 1903, 279 trespassers were killed, and 135 trespassers were injured.

In this country in nearly all of the non-fatal cases the injuries were of a serious nature. It would, I think, be safe to say that 75 per cent. of the cases resulted in a permanent disability, such as the loss of an arm, of a leg, and frequently of both legs. Under the law of averages, as the records will show, of those killed and injured, 14,137 were between the ages of 14 and 21, and 10,603 were under 14 years of age. This does not take into account the large number of trespassers, nearly all of whom, general observation tells us, are under 14 years of age, who are killed and injured on the street and interurban railways, for which there are no statistics in existence. The number of such cases, if known, would, I believe, equal or exceed the number reported by the steam railroads. During the same time a great many passengers, the exact number cannot be told; but it is, I think, increasing every year, were injured by stones thrown by children at trains or street cars, many of these injuries resulting in more or less loss of vision caused by flying pieces of glass getting into the eyes of the occupants of the cars.

If there is anything that is dear and precious to every man and woman and at the same time valuable to the state it is the safety and welfare of our children, and yet this awful slaughter, which the railroads are powerless to prevent, increases each year and no organized effort is made to stop it. The result is that untold suffering, misery and humiliation is brought to thousands of children and adults, and sorrow and grief enters the doors of an equal if not a greater number of homes every year, and at the same time our poorhouses and charitable institutions are being filled up with cripples who might otherwise have become industrious and helpful citizens, but who are a burden to the community.

At the present time the public press is teeming with articles in relation to disastrous passenger train wrecks and the consequent loss of life, which all admit are deplorable, and yet any effort to hold criminally responsible the officials and employees at fault for these accidents generally result in their acquittal. Public meetings are being held denouncing the two governments now at war in the Far East (and calling upon our government to intervene and bring about peace) for the awful and unnecessary slaughter of the soldiers of both nations. But, so far as known, nothing is said or done to prevent this annual maiming and killing of trespassers, which amounts to more than the number of those killed and injured in the battles now raging so fiercely, and yet the lives and limbs of our children and of the others killed and injured trespassing on the tracks and cars ought to be and are just as dear to their families and valuable to the state and to the world as those of the passengers killed and injured in the train wrecks, or of the soldiers killed and injured in battle.

These figures demonstrate that it is time something was done by the state, municipal, school and church authorities, as well as by the philanthropic societies, to protect the lives and limbs of the children of our country and the vision of its citizens traveling on our railroads. Such protection can, I think, be obtained by enacting and enforcing laws and ordinances that will prevent children and adults from going on the tracks and about the stations, entering the railroad yards—many boys and girls are now sent into the yards by their parents to pick up fuel, steal grain and merchandise, and if not killed while doing so, sooner or later join the criminal class. Jumping on and off moving trains or street cars and stoning trains and street cars should alike be penalized.

If the first object of our Government is to protect the lives of our citizens, how woefully it has failed to carry out that purpose, these figures furnished by itself show. Why it would not be proper and right to employ some of the blue-coated and brass-buttoned men in our cities and country towns to protect the lives of the children, instead of devoting all their time to the safe guarding of property from thieves, I leave the public to answer. And if we can afford to pay hundreds of millions for building a fleet to protect our citizens and commerce, why could we not invest a few thousands in the work of a commission to investigate this matter and try to find a remedy, which, with proper effort, could be found, to protect the people who will be called upon in time of war to man the fleet, as we all know that the part of our population who are the chief sufferers from this class of accidents furnishes its full share of our sailors and soldiers.

If the laws and ordinances now existing, prohibiting walking on the track, in the yards, jumping on or off moving trains or cars, were enforced; and where there are no such laws, if proper ones were enacted and enforced, this frightful death and injury roll of children and adults would be reduced. What would be thought of a father or mother who gave a child a loaded pistol to play with and then, when the inevitable happened, blamed the pistol? Yet, every day, parents take their children to walk on the tracks, and frequently over bridges and trestles, where trains going in both directions are likely to pass at the same time, thereby encouraging the children to go there alone. The records of the courts, which in Cook county, Ill., are swamped with "personal injury" litigation to the extent that the situation really amounts to a denial of justice in meritorious cases (although it is said there are more judges in that county than in all England) show that the blame is never placed on the parents, who, jointly with the state, are really at fault.

To me it seems both as important and as practicable for parents, schools and churches, to teach children the danger of being about the station, tracks, yards and cars, and to instruct them how to avoid injury to themselves and to others, as it is to teach them christianity, morality, truthfulness and cleanliness, and to spend time in lessons about the lives of birds and insects, the culture of flowers, etc.

While a large proportion of the adult trespassers killed and injured on the tracks and cars are tramps, whose lives are of supposed little value to the community but who still are human beings, a considerable number of the adults are industrious citizens who ought to but don't know any better than to put themselves in a place of such great danger, and whose lives are of value to their families and to the state. As a matter of dollars and cents it would cost the community less to keep trespassers off the tracks and cars than it does to care for them when injured and investigate the cases and bury them when killed. I think, as said above, that if a combined and intelligent movement was inaugurated by the state, municipal, church, school, philanthropic societies and others, that it could be brought to a successful issue and an end put to this great evil—one might almost say, this national crime.

———————, *Claim Agent.*

Proposed Union Station for Buffalo.*

In our issue of Dec. 30 mention was made of the proposed site agreed upon for a union station in Buffalo, by the 13 railroads entering that city. An idea of the frequency of train movements required at a union station in Buffalo may be gained from the knowledge that at the present time the aggregate number of daily movements passing a fixed point at the four present passenger stations in Buffalo is about 4,300, as compared with 5,000 at the Grand Central Station, New York; 1,957 at St. Louis, and 4,000 at the South Station, Boston.

The 13 railroads interested in the suggestion of a new union passenger terminal are now accommodated in four separate stations, as follows:

	Railroads.	Now occupying
(1)	N. Y. C. & H. R. R. R., including West Shore Division.	N.Y.C. & H.R. R.R. Exchange St. Station.
(2)	L. S. & M. S. Ry.	
(3)	M. C. R. R., including the T., H. & B.	
(4)	P. R. R. (W. N. Y. & P. R. R.)	
(5)	B., R. & P. R. R.	
(6)	Grand Trunk R. R.	
(7)	Pere Marquette R. R.	
(8)	Erie R. R.	Erie R. R. Station on Michigan St.
(9)	N. Y. C. & St. L. R. R.	
(10)	Wabash R. R.	
(11)	Lehigh Valley R. R.	Own station on Washington St.
(12)	D., L. & W. R. R.	Own station on Main St.
(13)	Buf. & Susq. R. R.	Not yet entered the city.

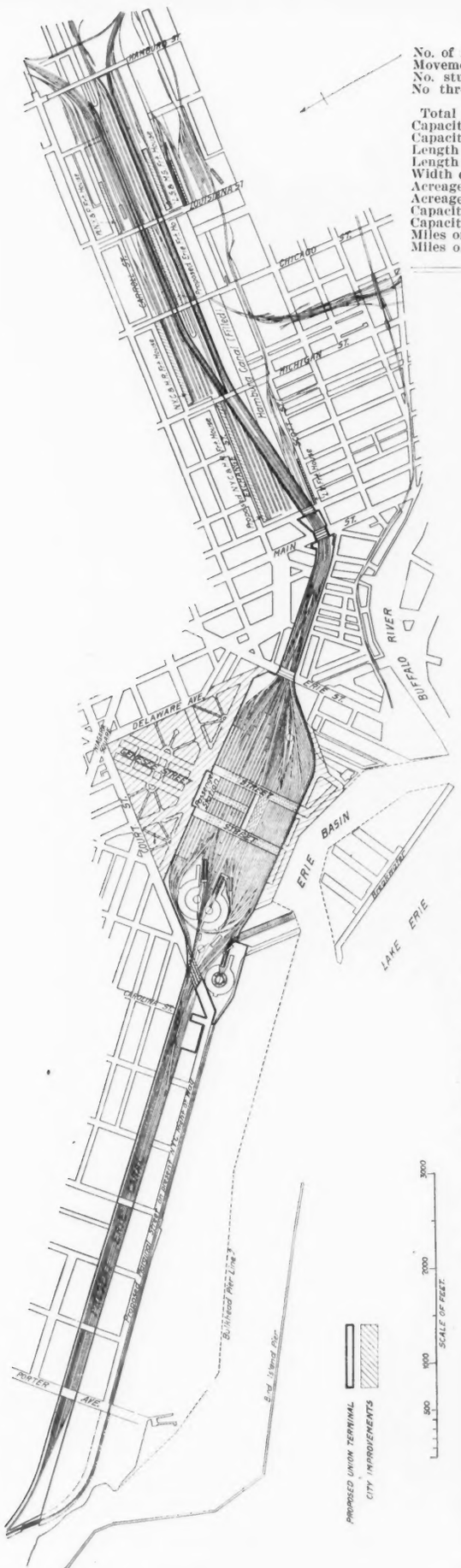
The Genesee street site agreed upon by the railroads as an ideal location for a union station was originally suggested by Mr. Cary and expanded to embrace the territory from Exchange and Hamburg streets to Fort Porter, is illustrated within the heavy border lines on the accompanying illustration. It meets practically all of the essentials necessary for a properly designed union passenger terminal.

The station is at the center of a number of radiating streets connecting with the business and residential sections of the city, and by extending Erie street with a tunnel under the Buffalo River the station will be in direct touch with a short route to South Buffalo. It also holds an excellent relation to the street railway system, for with but a few minor changes in the street railway tracks, a belt line service can be afforded around the station that will permit a through movement of street cars from every direction of the city.

The arrangement of the entrance to the terminal from the east eliminates the existing grade crossing of the tracks of the Erie and of the New York Central at Exchange street, and the proposed connection of the Ohio street branch of the New York Central with the Lake Shore or with the tracks of the Lehigh Valley in Scott street, eliminates the existing grade crossing of the Ohio street freight traffic over the tracks enter-

*Extract from a report of W. J. Wilgus, Fifth Vice-President, N. Y. C. & H. R. R. R., on the proposed Union Station terminal at Buffalo.

Items.	Buffalo—Proposed new terminal.	Buffalo—Aggregate present terminals.	Boston South Station.	St. Louis.	Pittsburg.	New York G. C. Station.	Philadelphia Broad St.
No. of railroads	13	12	2	20	1	2	1
Movement daily passing tower	.....	4,300	4,000	2,500	.....	5,000	3,618
No. stub platform tracks	12	.....	28	32	8	19	16
No through platform tracks	20	.....	0	0	6	0	0
Total No. of tracks	32	24	28	32	14	19	16
Capacity locomotives	97	.....	.....	.....	.....	.....	.....
Capacity cars	1,371	651	1,179	1,100	.....	814	.....
Length of terminal, miles	3.13	....	.....	.....	.....	.....	.....
Length depot parcel, ft.	3,250	.....	.....	.....	.....	.....	.....
Width depot parcel, ft.	1,025	.....	.....	.....	.....	.....	.....
Acreage, total	107	.....	.....	.....	.....	.....	.....
Acreage depot parcel	67	31	35	20	.....	23	17
Capacity through platforms in cars	15	.....	0	0	13	0	.....
Capacity stub-platforms in cars	6	.....	12	11	13	11	.....
Miles of track in depot parcel	25	12	15	9	.....	9	.....
Miles of track, total	34	.....	.....	15	.....	23	.....



General Plan of Proposed Union Terminal at Buffalo.

ing the passenger station. As shown in the illustration, ample provision is made for tracks for the storage, cleaning and equipping of cars and locomotives. This arrangement will be of great service in permitting an economical handling of traffic at a union terminal.

The tracks and buildings shown on the plan will afford practically twice the facilities now existing in the aggregate in the four passenger terminals at Buffalo. These ample facilities, with storage facilities convenient to the station, avoiding the duplication of movements in and out of the station, and the eight main tracks from the east and two main tracks from the west, all give ample room for expansion as business increases in the future. While all of the land is shown utilized on the plan, it is expected that only such portion of the tracks and buildings will be built as may be needed from time to time as the business grows. This location is arranged so that the larger portion of the facilities can be provided without in any manner interfering with the present method of handling business.

The abandonment of the existing passenger facilities of the New York Central, Lehigh Valley and Erie Railroads along Exchange and Washington streets will make feasible the utilization of that territory for the local freight terminals as the city grows. The proposed additional freight facilities of the New York Central between Michigan and Washington streets will replace the existing Erie street freight terminal of that company which is within the territory to be used by the proposed new union terminal. Provision is also made for a new modern local freight terminal for the Erie between the main line passenger tracks of the various companies, thus giving that company a chance to increase its facilities and also eliminate the grade crossing of the freight traffic of the Erie over the New York Central passenger tracks. The loop near Court street will permit trains to pull directly into the station and thence pass around the curve and proceed westerly without a reversal in the direction of the train. It is believed that this arrangement will not only reduce the cost of operation and chances of accident in the interchange of traffic, but also more than compensate for the slightly longer distance traversed by trains between the east and the west via these two routes. Ample provision is made with intermediate switching leads so as to permit the breaking up and making of passenger trains without fouling main line movements.

This plan will also eliminate every grade crossing remaining in the city of Buffalo between Main street and Fort Porter. The cross latched portions shown in the illustration are the proposed improvements to be undertaken by the city of Buffalo in conjunction with the new union passenger terminal. The park, with boulevards between Niagara square and the new station, will be a great ornament and attraction to the city. The new steamboat wharves or excursion docks to be built by the city will also be in close touch with the street railways and steam railroads, and will add to the city, the facilities for which there has been a great demand for many years. The proposed new marginal street upon a portion of the existing right-of-way of the New York Central from Fort Porter to Georgia street, will also afford a faciiity which has been under discussion for a long period.

The accompanying table shows a comparison of the proposed Buffalo union terminal with similar facilities in other cities:

From these statistics it will be noted that the proposed Buffalo terminal will have space sufficient to ultimately expand to a size larger than that of any union railroad terminal now existing in this country, and it will also be noted that the facilities are practically double those of all lines now entering the city of Buffalo. The entrance to the proposed union terminal from the tracks of the existing companies is to be effected as follows:

New York Central, Lake Shore, Erie, via direct connections.

Pennsylvania, Buffalo, Rochester & Pittsburg, Grand Trunk, Pere Marquette, Michigan Central, via existing rights over New York Central.

New York, Chicago & St. Louis and Wabash, via existing rights over the Erie.

Lehigh Valley, via direct connections; or, if desired, by new trackage agreement to be made with N. Y. C. & H. R. R. R., from Depew to Exchange St.

Delaware, Lackawanna & Western, via new trackage agreement to be made with N. Y. C. & H. R. R. R. from Depew to Exchange St., or with L. S. & M. S. Ry. from Sandusky St. to Hamburg St.

Foreign Railroad Notes.

Messrs. O. Blum and E. Giese contribute to the *Journal* of the German Railroad Union an illustrated account of the transfer freight station of the Chicago & North Western Railway in Chicago. They say that such transfers of package freight from car to car in Germany are usually made at the station freight houses, where the room is often badly needed for local receipt and delivery.

Among the 9,600 freight cars to be delivered within the six months beginning with next April for which the Prussian State Railroads are letting contracts, 35 are to be six-wheeled box cars with air-brakes and warming apparatus, 1,730 four-wheeled box cars

with brakes, and 4,278 without brakes, 50 eight-wheeled flat cars 42 ft. 6 in. long, 100 hopper coal cars, 40 of which are to have brakes, and 180 20-ton and 1,200 16½-ton coal cars, 900 of the latter without brakes.

New Automatic Block Signals on the Lackawanna.

The Delaware, Lackawanna & Western has lately begun the construction of Union automatic block signals on 71 miles of its main line (from Hallstead to Elmira) and on 28 miles of this section the signals are already in use. These signals are operated by electric motors, which are run by currents from storage batteries, and these batteries are charged from power stations situated along the line at intervals of about 20 miles. It is expected that the cost of maintenance of storage batteries will be so much less than that of the primary batteries usually used for automatic signals that the additional first cost of the storage battery and generator plant will be saved several times over.

A condensed diagram showing the location of the new signals from Binghamton eastward to Hallstead, about 14 miles, is given in Fig. 1. The whole of the line is double-track. The power houses are at Hallstead, Willow Point, Lounsberry, Lowmans and Elmira. The distance from Hallstead to Willow Point is 19 miles; thence to the next station, 21 miles; and the next two intervals are 24 miles and seven miles. The generators at Hallstead and Elmira will be available for signals outside of the present installation. A typical power house, that at Willow Point, charges batteries at 44 signals (88 arms)) 22 of these signals being east of the station and 22 west. Fig. 2 shows a part of the diagram of the wiring leading from this station to the signals, and Figs. 3 and 4 are from exterior and interior photographs of a power house. Each power house is 10 ft. x 15 ft. inside, with 8 in. walls, and each contains a 500 volt generator of a capacity of 2.5 k.w. and 5 amperes. The generator is run by a gasoline engine of 4 h.p. weighing about 500 lbs. Both engine and generator are furnished by Fairbanks, Morse & Company. The stations are not provided with duplicate engines, but there is one spare engine which in case of breakage can quickly be substituted for any one of those in use. The liability of interruption from breakage is, however, quite remote, as the batteries at each signal will perform their duty for eight days or more without recharging. At each signal there are two banks of five cells each, 24 ampere-hour cells, made by the Chloride Accumulator Company of Philadelphia. The line wire, strung on cross-arms fixed to the telegraph poles below the telegraph wires, is No. 10 hard-drawn copper, covered with K. K. weatherproof braided insulation.

Each maintainer attends to the signals on 15 miles of road and also to the gasoline engines. The battery man is also available to assist in the care of the engines. The battery man's work is, of course, greatly reduced, the only batteries requiring cleaning being the gravity cells used for the track circuit. The maintainer starts out on his velocipede hand car every third day, and at each signal turns a switch throwing one bank off from the signal and on to the charging line, and the other one off from the charging line and on to the signal.

The signals are the Union Switch & Signal Company's standard semaphore with three-light spectacle castings. No line wires are used, the distant signals being controlled from the home by the reversal of the track circuit current and the use of polarized relays. Switches in the track are made to

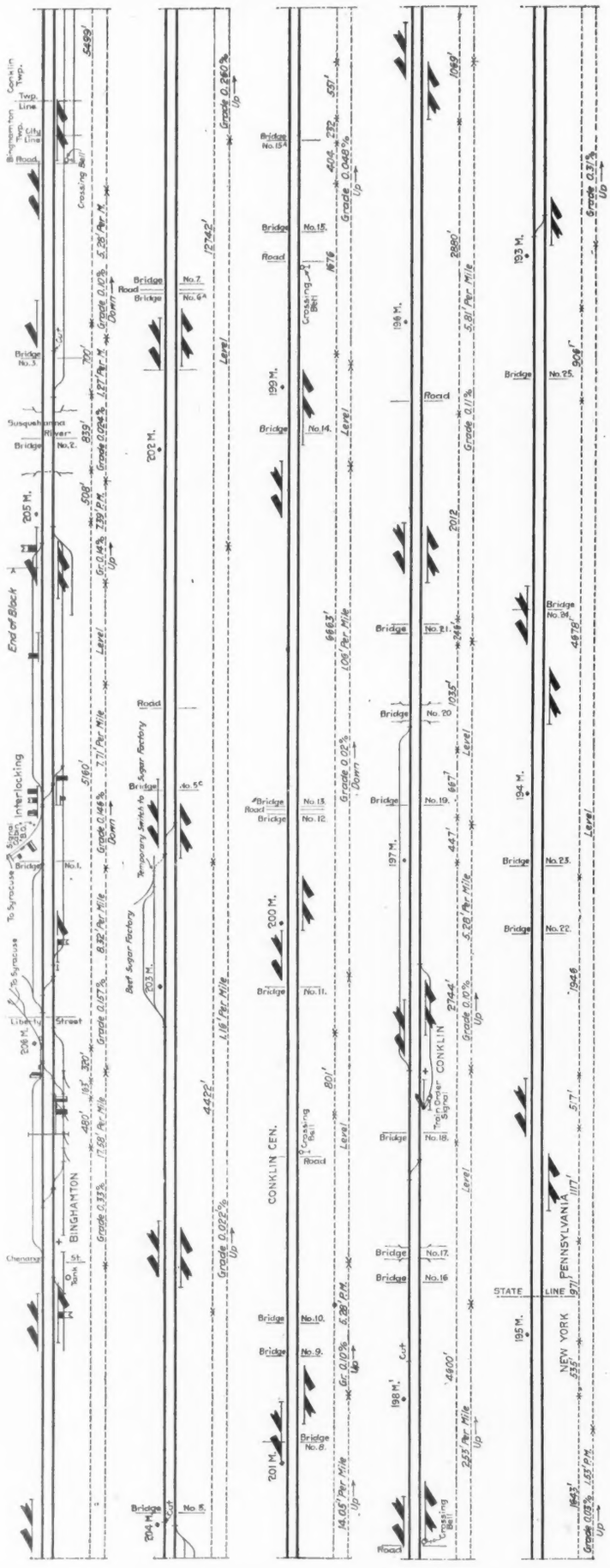


Fig. 1—Automatic Block Signals on the Delaware, Lackawanna & Western Railroad.

short-circuit the track circuit when they are set for the siding.

The main reason for using storage batteries is, of course, to economize expenditure. How much this economy will amount to is yet to be shown; but it is believed that the saving in working and maintenance charges will be sufficient to offset the additional first cost in perhaps five years. The relation of running expenses to first cost varies, of course, in accordance with the number of signals to the mile; and the existence of steam or gasoline engines or other power already in use for other kinds of work also may affect materially the cost of running the signals; though it appears that in the present case all the power plants are new and are used exclusively for the signals.

Fig. 3—Power House.

Rails for Lines with Fast Trains.*

BY P. H. DUDLEY, C. E., PH.D., INSPECTING ENGINEER NEW YORK CENTRAL.

Previous inquiries have been made by the Congress into the introduction of fast and heavy trains. The question therefore now to be studied and discussed is the relation of the rail section to this progress, since it has received the principal modification in the superstructure of the permanent way. The standard rail sections used in America, with but one or two exceptions, are of recent forms and types, having greater vertical and lateral stiffness than the 4½-in., 65 or 67-lb. sections of only two decades ago. The 5-in., 80-lb. sections average 60 per cent. stiffer, while the 5½-in. or 6-in. sections are 80 to 100 per cent. stiffer than the 4½-in. rails.

Greater smoothness has been secured with the stiffer rails which have been put in. Their inauguration in America marks an epoch in the evolution of the track, which has been followed by a great increase in the operating stability, efficiency and capacity of the railroads, on the same roadbed. The study of these relations is of first importance to the railroads and the Congress, and few of the many problems which will come before us are as intricate. The railroad companies, appreciating this, have replied fully to my detailed questions as to their recent practice and experience in the transition from the lighter to the heavier sections, and the preference is given to the stiffest sections reported for main line service. The replies present the most uniform repetition of figures as to the size and dimensions of the sections yet collected in the history of the Congress.

The dimensions of the sections in general use as shown by the replies received indicate that the important principle has been recognized that besides having sufficient strength to carry the trains, for "Rails for Lines with Fast Trains" the sections must be stiff enough to reduce deflections and secure the requisite smoothness of the track. In so flexible a structure as the rail in the track under rolling loads, stiffness is of more value to reduce undulations, than mere weight. The sections are further characterized by broad heads, having a top radius of 12 to 14 in., $^{5}/_{16}$ in. upper corner radii of the heads and $^{1}/_{16}$ in. for the lower corners and those of the edges of the base. The lateral as well as the vertical stiffness has been increased. Through the broad heads, the combined lateral and vertical stability produced between the moving locomotives, cars and the track, for the passage of the train, cause the wheel effects to load and hold the rails in a vertical position on the cross-ties, checking the tendency to roll out and spread the gage. With rails spiked only to the crossties, this is of importance, for they must carry and support not only the locomotives and cars, but guide and control their direction, without any other means to assist.

The increased stiffness of the section, with more efficient joints, on the same roadbed, has been followed by doubling of the axle load, and in some types of engines trebling the total load, with a corresponding increase of expended tractive effort. The speed of the trains has been augmented with loads in regular service, impossible even as experimental trips on the old light rails. In passenger service trains of 50 times the weight of Stephenson's Rocket run at treble the speed, while in the freight service trains 250 times as heavy are run at the same or faster speed. The theory of an inelastic roadbed, with stone crossties as rigid supports, has yielded to the theory of an elastic road-bed with crossties as flexible supports, and is general to steam railroads in every country. The permanent way of electric railroads in large cities is constructed now of stiff girder rails, on rigid supports and foundations, the deflections being 20 times less than for steam railroads. The uniform torque of electric motors conduces and permits such construction. In the replies received, there is a concensus of opinion as to the importance and value of the increased mechanical properties of stiffness of the rails as girders, for the present progress and service performed. The development of locomotives for the track has become to-day a second question of those pertaining to their better utilization.

The Mohawk & Hudson Railroad—now a part of the New York Central & Hudson River Railroad—the first railroad built in New York, chartered in 1826 and opened in 1831, was practically a straight line, with moderate gradients for the limited power of the engines. Inclined planes both at Albany and Schenectady were required, to raise or lower the cars by stationary engines to or from the general height of the plateau occupied by the railroad. The locomotives ran only between the heads of the inclines of Albany and Schenectady. The chief engineer, Mr. John B. Jervis, in the construction of the road adopted the universal system of solid supports for the track. Foundation pits, each of 9 cu. ft. of broken stone, 2 ft. square, 27 in. deep, and 3 ft. between centers, were made for each line of rails, and on these were placed stone blocks 16 in. high, 15 x 18 in. on the top, to receive the stringers for the strap rails. The stone blocks were drilled at right angles to the line, with two 1-in. holes, 9 in. between centers, to receive iron knees or chairs, to hold in place the 6 x 6-in. wooden stringers. A strap iron rail, 2½ in. wide, $^{9}/_{16}$ in. thick, with the upper corners rounded to 1⅞ in. in width, was spiked nearly central on the stringers. Two locomotives were used at first for the power—the De Witt Clinton,

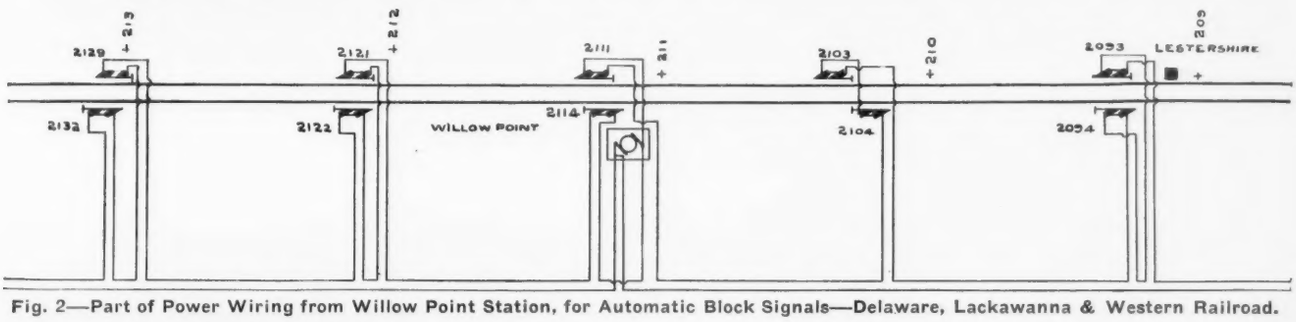


Fig. 2—Part of Power Wiring from Willow Point Station, for Automatic Block Signals—Delaware, Lackawanna & Western Railroad.

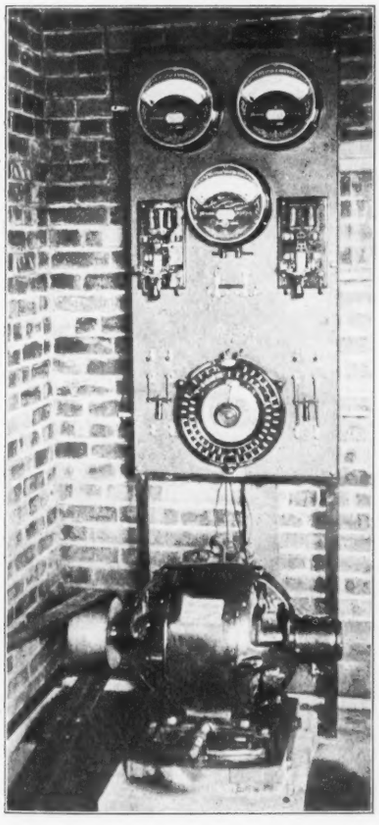


Fig. 4—Generator and Switchboard.

*Abstract of a report to be presented to the International Railway Congress, May, 1905.

which weighed 6,758½ lbs., and an English engine, the John Bull, which was constructed by Robert Stephenson & Co., Newcastle-upon-Tyne. The John Bull was mounted upon two pairs of driving wheels, the same as the De Witt Clinton, and weighed 12,742 lbs., the wheel base being 4 ft., 6 in. long. The weight was too great for the wooden rails, and as received this engine was seldom used in drawing the trains. The riding of the English engine was so unfavorable, and injured the track to such an extent, that it became necessary to remove the front pair of driving wheels, and Mr. Jervis substituted his four-wheel truck for them. This distributed the weight of the engine over a longer portion of the rails, and improved the riding, and was less injurious to the track. Before this was done, however, Mr. Jervis had devised his four-wheel leading and guiding truck. The plans were sent to the West Point Foundry Association, and an engine was delivered to the Mohawk & Hudson in 1832. The riding of this locomotive was decidedly superior to the ordinary four-wheeled type of engine.

Mr. Jervis was at that time also chief engineer of the Schenectady & Saratoga Railroad, and sent plans for the construction of a truck engine to Robert Stephenson & Co., Newcastle-upon-Tyne. On this road, after building three miles with stone supports, he abandoned the plan for crossties under the stringers. This made the foundation conform to the movements of the ible and powerful for mountain curves and gradients superceding inclined planes worked by stationary engines. The effort was made to secure a favorable conjoint action between the locomotive and the track. The flexible truck permitted sharper curvature and higher speeds, by uniformly loading the rails and subgrade. The locomotive passed over the undulations in the track with less general movement than was the case with the short wheel base of the four-wheel type of engines. These important principles in the construction of the locomotive and track were introduced practically at the inception of the construction of our railroads, and form the basis for our American practice to-day.

The New York Central has adopted the principle of sub-dividing the load and extending the wheel base for their high speed electric locomotives, by mounting a pony truck on either side of the motor wheels, in order to assist the rails to carry and distribute the heavier loads. This is the first time the principle has been recognized in electric traction, and properly supplements the work of Jervis in 1832, on the Mohawk & Hudson, for steam locomotives to give ease of running and high speeds.

The permanent way of steam railroads in all countries is flexible, the superstructure forming a floating mechanism to receive and distribute the moving loads to the compressible subgrade. The rails, crossties, ballast, and the subgrade are depressed temporarily from their unloaded position in the trackman's surface, to their loaded position in the "General Depression," under the effects of wheel loads and the generated forces of the moving locomotives and cars. The running surface of the rails is from .2 to .4 in. below the trackman's surface in the "General Depression," with specific deflections under each wheel contact, more or less uneven and consequently not always parallel with the unloaded surface. The specific deflections being produced by and under the wheel contacts, differ for each class and type of locomotive, in loading the foundation, for the same rails and portions of the permanent way, admitting of definite comparisons between them.

The trackmen of greatest skill are not able to surface the rails and tamp all of the crossties so they will depress equally under the moving loads, those for the joints loading the ballast and subgrade differently from the others, though they do secure excellent riding track under the well designed wheel bases of the locomotives and cars. It is the combined wheel loads and spacing which produce, limit and control the specific deflections more than the spacing of the flexible supports of the crossties. It is taking advantage of this important fact—the fundamental principle of the American theory and practice—to properly load the stiffer rails and subgrade by a distribution of the total weight of the engine, which has permitted doubling the axle and total loads of the locomotives and cars, and at the same time made it possible to secure and maintain smoother and better tracks than was possible on the lighter and more limber rails.

The ballast and subgrade or formation level, are depressed from one-fifth to one-third of the amount of the temporary subsidence of the rails, from their unloaded condition in the trackman's surface, to their loaded, constrained, stiffened and strengthened condition in the "General Depression." There is not, mathematically speaking, a similar beam exercising such diversified functions, described in mechanics, and therefore it is only by observation in the track, and investigations in service, that its properties can be traced and understood.

If the weight of the engine was supported upon a long wheel base of only two pairs of wheels, so that one pair did not assist the other in distributing the load, then the gain by increasing the stiffness of the rail would be but little more than the comparative stiffness between the two sections. The rail section is converted into a constrained beam on flexible supports, particularly for the driving wheel loads, when depressed by the wheels of the passing locomotive or cars from the trackman's surface to its lower, loaded running surface in the "General Depression." The term constrained beam is used to distinguish it from the "restrained beam" of mechanics, and also the fact that the mechanical properties of the modern rail sections constrain, compel and direct the forces incident to the wheel effects of the moving locomotives or cars, to follow definite predetermined directions. The width of the head of the rail must be sufficient, in connection with its top radius, to compel the resultant of the vertical forces of the wheel effects to fall within its base on the crossties, for vertical stability as a section. and to give the requisite lateral stability to the passing locomotives and cars.

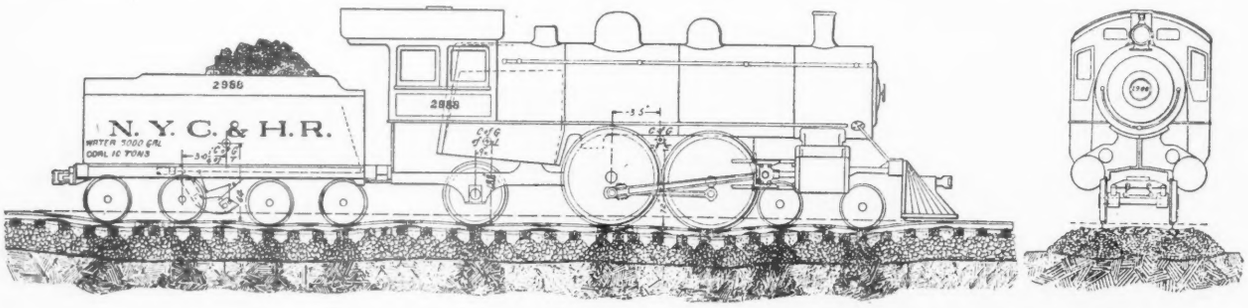


Fig. 1—General Depression of Track under Central Atlantic Type Locomotive and Tender.

The determination of the action of the rail under load can only be made through positive measurements of the distribution of the unit fiber strains in the base of the rails, under moving locomotives and cars. This action has been traced by my investigations with my stremmatograph, and serve to explain and confirm the theory and practice on which modern rail sections have been designed. The recent stiffer rail sections and better joints permit measurement or comparions of the unit fiber stresses and the bending moments between types of locomotives.

In the *Bulletin of the International Railway Congress*, June, 1904, there was published the comparison of the unit fiber stresses and bending moments of locomotive No. 870, an eight-wheel engine drawing the Empire State Express, and locomotive No. 2,032, a 10-wheel type of engine, for the same location, drawing the Southwestern Limited, a train over twice as heavy. The bending moments in inch-pounds per pound of static load are in favor of the 10-wheel

superstructure. The cost of the construction of the roadbed was reduced nearly one-half by discarding the use of broken stone foundations, which at that time cost $2 per cu. yd., and the riding was smoother than that of the Mohawk & Hudson, with its superstructure placed on rigid supports. The engine with the four-wheel truck constructed by Robert Stephenson & Co. was called the Davy Crockett and was received by the Schenectady & Saratoga in 1833. The riding of the engine was the steadiest of any so far constructed, and with a large fire-box to burn coal, was a decided success from the start.

Mr. Mathias W. Baldwin, of Philadelphia, the founder of the *Baldwin Locomotive Works*, before constructing his second locomotive, the E. L. Miller, in February, 1834, visited the Mohawk & Hudson and approved and adopted the Jervis truck. This was sufficient to insure its general use, and four locomotives of similar type were delivered in 1834 to railroads now forming part of the Pennsylvania System. Henry R. Campbell, of Philadelphia, in February, 1836, patented his eight-wheel engine, a four-wheel bogie truck with four driving wheels, and one was constructed, and completed May 8, 1837, the first American type of engine. Messrs. Eastwick & Harrison improved the construction, adding an equalizing frame for the driving wheels, subsequently reduced by Mr. Harrison to equalizing beams, as used to-day.

The locomotive was now sufficiently flex-

type, which indicates that the foundation under the same superstructure was more favorably loaded.

Two recent stremmatograph tests of 12 and 10-wheel engines drawing freight trains on the Central Railroad of New Jersey, on 85-lb. rails, crossties 8 ft. 6 in. long, 9 in. wide and 7 in. thick, 16 to the 30-ft. rail, are important and interesting, in showing the effects of the wheel base in the distribution of the load to the foundation, on that construction of superstructure. The 12-wheel engine was drawing a train of 64 loaded 80,000-lb. cars, and the total positive bending moments for the engine were 610,093 inch-pounds, 6.07 inch-pounds per pound of static load. The negative bending moments for the engine were 319,928 inch-pounds, 3.183 inch-pounds per pound of static load. The positive bending moments for the tender were 360,109 inch-pounds, 6.16 inch-pounds per pound of static load. The negative bending moments for the tender were 184,514 inch-pounds, or 3.16 inch-pounds per pound of static load. The positive bending moments under the engine were small and constrained by large negative bending moments, the thickness and length of the crossties being important contributing factors.

The 10-wheel engine was drawing 53, 80,000-lb. cars, over the same stretch of track. The positive bending moments of the engine were 741,117 inch-pounds, 8.616 inch-pounds per pound of static load, while the negative bending moments were 238,082 inch-pounds, 2.768 inch-pounds per pound of static load of the engine. The longer wheel spacing increased the positive and reduced the negative bending moments. The front wheels of the tender truck were rough, and increased the positive bending moments under them. The total positive bending moments for the tender were 333,308 inch-pounds, 7.407 inch-pounds per pound of static load, while the negative bending moments were 141,366 inch-pounds, 3.140 inch-pounds per pound of static load.

For the engine and tender the positive bending moments were 1,074,325 inch-pounds, 8.201 inch-pounds per pound of static load. This includes the increased bending moment due to the forward truck wheels being rough. The total negative bending moments for the locomotive were 379,448 inch-pounds, 2.895 inch-pounds per pound of static load. Correcting the positive bending moments of the tender for the pair of rough wheels, to correspond with the average of the other three pairs of wheels, they reduce to 277,088 inch-pounds, 6.02 inch-pounds per pound of static load. This would make the positive bending moments for the locomotive, with smooth wheels 7.773 inch-pounds per pound of static load.

For the 12-wheel engine and tender the positive bending moments were 6.15 inch-pounds, and the negative 3.11 inch-pounds, respectively, per pound of static load; decidedly more favorable reciprocal reactions of the rails, crossties, ballast, and the subgrade, than for the 10-wheel type of engine. As the series of tests were made at the same place and within less than one hour apart, they indicate definitely that the longer wheel spacing of the 10-wheel locomotive does not load the foundation as favorably as the shorter wheel spacing of the 12-wheel locomotive.

Fig. 1 represents a typical "General Depression" of the rails, crossties, ballast and subgrade, under a locomotive of the Central Atlantic type, the scale of the depression of the rails, for illustration, being enlarged vertically 80 times. The broken horizontal line indicates the unloaded trackman's surface, while the undulating rail under the wheel contacts and wheel spacing, represents its depressed and loaded running surface in the "General Depression." The resolution of the wheel effects by the mechanical properties of the section, into positive and negative bending moments, their horizontal components of strain in the metal of the head and base are indicated by a contour of black in the head of the rail under the wheel contacts for the compressive strains above the neutral surface, and below, by a contour of lines for the tensile strains under the wheels. In the wheel spacing the strains are reversed, and their character is designated as already described. At the points of flexure in the rail between the positive and negative bending moments per wheel they are connected but not represented by heavy shearing strains in the web of the rails. The positions of the center of gravity of the engine, tender, and for the whole locomotive, are indicated, when ready for service, as static loads. The vertical heights are by calculation, while the horizontal position was determined from test. These will be slightly modified when running and drawing trains, by the drawbar-pull, also the changing load of the tender.

When the locomotive is running, the "General Depression" is continued to and includes that of the first coach truck, in passenger service. In freight service, on 80-lb. or stiffer rails, with the present 60,000-lb. cars or larger, it is continued to the rear of the train, an important factor in reducing train resistance.

On the 100-lb. rails, the locomotive represented by the tests has distributed in part the increased stresses due to its expended tractive effort through the drawbar-pull, in starting trains, to all of the wheel contacts of the locomotive. On 80-lb. rails, at speeds of 40 to 45 miles per hour, the distribution is from one-half to two-thirds of the length of the wheel base.

We have much to learn of what may, can and does take place in the stiff rail sections in the "General Depression" under moving locomotives. Two stremmatograph tests were made for the purpose of tracing the distribution of the stresses due to the expended tractive power of the locomotive when drawing its train.

The first test was with the engine light, backing over the stremmatograph, and in a few moments came forward. The second test was made with the same engine drawing its train. It indicates that the unit fiber stresses are increased under all of the wheels of the locomotive, and also the bending moments. The effect of the expended tractive effort through the drawbar-pull and the stiff rails, was distributed for the entire length of the wheel base of the locomotive, instead of being restricted to that of the driving wheels. The total wheel effects under the light locomotive for one rail were 1,368,706 inch-pounds, and 1,864,363 inch-pounds, when drawing the train, an increase of nearly 500,000 inch-pounds, or 1,000,000 inch-pounds practically for both rails.

In comparing the unit fiber strains for the same locomotive in limber rails, with those of stiff rails, as would be expected, there is a decided decrease, but when reduced to comparative bending moments for the two sections, they show that the total is usually greater in the stiffer section. With the limber sections, the crossties and foundation must carry directly more of the loads than is the case with the stiffer rails. Their bending moments increase and consequently reduce the intensities of pressure to the crossties and ballast directly underneath the rails, the metal of the rail doing more work to sustain the train and distribute its load to the foundation.

(To be continued.)

Methods of Location on the Choctaw, Oklahoma & Gulf Railroad.*

BY F. LAVIS, ASSOC. M. AM. SOC. C. E.

The writer has been connected with surveys for the location of railroads in many parts of the United States and in South and Central America, during the past 15 years, and has been impressed by the wide variation in methods adopted by different men and railroad companies, and, to a great extent, by their general assurance that the methods of each were right, and, having had all kinds of assistance and equipment, from almost nothing up, was, therefore, all the more ready to appreciate the conditions under which the surveys were conducted which form the basis of this paper.

During 1902 the writer was engaged in making location surveys for the Choctaw-Oklahoma & Gulf (now part of the Rock Island System) in Oklahoma, Indian Territory and Northern Texas. F. A. Molitor, M. Am. Soc. C. E., was Chief Engineer, and E. J. Beard, M. Am. Soc. C. E., Principal Assistant Engineer, and to them the writer is largely indebted for much of the matter contained in this paper.

Many different lines were investigated, and, between 1898 and 1902, some 800 miles of branches and extensions of this road were built, scattered through five different states and territories. At times as many as 10 or more locating parties were in the field at the same time; the methods adopted, therefore, were such as were adapted to maintaining parties in the field continuously.

The writer has confined himself entirely to the methods of making surveys, and the organization and equipment of parties, as practiced generally on this road, with whatever added notes from his own experience he has thought useful, and has not attempted to consider in any way the theory of railroad location.

It is obvious, of course, that the equipment of field parties must vary with the locality in which they are engaged. It is the general practice, however, except in a very few of the northeastern states, to provide the parties with a camp outfit more or less complete, according to the policy of the road, its financial status, and the facilities of transport. It is the writer's experience that the completeness of the survey is very apt to vary directly with the completeness of the outfit supplied by the railroad, and he has, therefore, entered more or less minutely into details of camp equipment.

The following is a list of the camp equipment furnished by the Choctaw, Oklahoma & Gulf Railroad:

1 Office tent with fly, 14x16 ft.	6 camp chairs.
3 Tents, 14x16 ft.	Stationery and map chest with necessary stationery, blank forms, drawing, paper, etc.
1 Cook tent, 16x20 ft.	
3 Drafting and office tables.	

DINING TABLE.

3 doz. agateware dinner plates.	3 round agateware 2-qt. pans.
3 doz. agateware cups.	6 round agateware 1-qt. pans.
2 doz. agateware saucers.	1 round agateware 1-pt. pan.
2½ doz. steel knives.	1 carving knife and fork.
2½ doz. steel forks.	7 yd. oilcloth, 48-in. wide.
2½ doz. German silver teaspoons.	3 standard trestles (see sketch, Fig. 3).
1½ doz. German silver dessert spoons.	5 boards, 12x1½-in. x 18 ft. (dressed).
1 doz. German silver tablespoons.	
6 tin salt boxes.	
6 tin pepper boxes.	

COOKING UTENSILS.

1 No. 8, six-hole, wrought-iron range	1 flour sieve.
1 tea-kettle.	1 collander.
1 large cast-iron pot.	1 5-gal. tin dishpan.
1 small cast-iron pot.	1 5-gal. tin bread pan with cover.
2 large frying pans.	1 chopping bowl.
1 small frying pan.	1 bread board.
2 griddles.	1 rolling-pin.

*Extract from a paper presented to the American Society of Civil Engineers and printed in the *Proceedings*, page 864, December, 1904.

4 tin pans with covers,, 1 gal. each.
2 stewpans.
1 3-gal. coffee pot.
1 gal. teapot.
4 dripping-pans.
6 baking tins for bread
12 tin pie plates.
2 butcher knives.
1 steel.
2 large meat forks.
1 chopping knife
1 meat saw.
2 large iron spoons.
1 soup-ladle.
1 cake turner.
1 biscuit cutter.
1 coffee mill.
1 nutmeg grater.
1 spring balance.
6 galvanized iron buckets.
6 tin dippers 1 for each tent and 2 in cook tent).
2 can openers.
1 corkscrew.
1 broom.
1 scrubbing-brush.
1 alarm clock.
1 table (same as drafting tables).

MISCELLANEOUS.

6 Dietz lanterns.
3 large tin lamps (central draft, round wicks.
2 large galvanized iron washtubs.
1 washboard.
4 Sibley stoves, 4 l'gths pipe with dampers, 12 lgths plain pipe (see Fig. 1).
2 water kegs, 2 gal. each.
6 washbasins.

TOOLS.

1 grindstone and fittings.
1 monkey wrench.
1 pick.
2 shovels.
1 short crowbar.
1 hand-saw.
1 cross-cut saw.
2 hand axes.
4 chopping axes.
6 axe handles.
1 bundle sail twine.
6 sail needles.
1 sail palm.
10 lb. assorted sizes wire nails.
100 ft. manila rope, ¾-in.

LUNCH BOX.*

2 doz. agateware dinner plates.
2 doz. agateware saucers.
1½ doz. German silver teaspoons.
1½ doz. German silver dessert spoons.
1½ doz. steel knives.
1½ doz. steel forks.
1 2-gal. coffee pot.

*On the Choctaw, Oklahoma & Gulf Railroad, this extra equipment for the lunch box was not ordinarily furnished; the writer, as explained later, believes it to be economy, however, to provide this.

Tents.—The tents furnished were of 12-oz. duck, roped on the seams and ridges with ¾-in. Manila rope. They were without ridge poles, four upright poles supporting the center, and four on each side supporting the walls. Tackle was, also, provided, and two single blocks on the front guy rope, there being rectangulr door flaps at each end, with substantial leather buckles for fastening them. Leather stove pipe holes with asbestos filling between the leather were provided. The office tent had 5-ft. walls; the others, 4 ft.

The writer believes that, when the genuine Mt. Vernon army duck can be obtained, 10-oz. duck gives practically as good service, as far as life is concerned, as 12-oz.; the stiffer duck, when folded, easily cuts and wears in the creases when carried in the wagons. In very hot weather, or in a very rainy country, a 12-oz. fly is desirable. In cold weather, with the lighter-tents, in sizes above 14 by 16 ft., it is difficult to heat a tent of 10-oz. duck with the ordinary Sibley stove, but, if necessary to provide camp equipment in a cold climate, the whole equipment can be kept down to that size.

Drafting Tables.—The tops of the drafting tables were of ⅞-in. clear white pine, with hinged legs, connected by 3-in. webbing, arranged so that the legs folded flat against the tops. When moving camp, the tables were placed face to face and tied together, thus preventing injury to the tops.

Dining Table.—The planks forming the top and seats of the dining table are placed in the bottom of the wagon when moving camp, as they take up very little room in the bed of the wagon, and the projection of the planks at the rear provides support for the stacked Sibley stoves and other light equipment. The legs of the lower portion of the horses are so spaced as to straddle the wagon and drop down between the bed and the rear wheels.

Stationary and Map Chest.—It is important that this chest should be well and strongly made. The protection of the maps, etc., often the results of the expenditure of thousands of dollars, should not depend on any cheap or temporary expedient, as is often the case. It is not an uncommon experience to be caught in the rain while moving camp, and the best of tents are not always impervious to water. It should be insisted upon that all maps, notebooks, etc., should be placed in the chest over night. Necessary stationery, drawing paper, supplies, etc., will vary with different requirements and individual preferences.

Lunch Box.—The midday meal being eaten in the field, a substantial lunch box should be provided, with a separate equipment of plates, knives, forks, etc., from that used in camp.

The party should be ready to start for work immediately after breakfast, and should not be kept waiting while the breakfast dishes are being washed to go into the lunch box, nor should they have to wait for their supper, while the dishes used on the line during the day are being prepared for use. The lunch box can often be best designed in camp after starting, so that it can be made to fit the supplies purchased.

On being organized, the party with which the writer was connected proceeded by rail to the point nearest the proposed line, at which place teams had already been engaged. The cooking utensils and a preliminary bill of supplies had to be purchased, however, that and the loading of the teams occupying the remainder of the day of arrival.

The following day at 6 a.m. the outfit was started. Most of the men walked, about one-fourth of them at a time being allowed to ride. Thirty miles over poor roads were covered by 5 p.m., a camping place was selected, tents put up and the men were eating supper by 7 p.m. The first stake was driven before 8 a.m. the next morning, and the work fairly started. This is not noted as an uncommon occurrence, but as representative practice.

In winter the men were called by the cook at 6 a.m. Breakfast was ready at 6.30, and a start was made for the work at 7 a.m.; in summer, half an hour earlier. The teamsters were called and had their breakfast half an hour before the other men, so that they had their teams hitched up and ready to start as soon as the men had breakfasted. Two teams were used on the line, one staying with the topographers. The third team was kept busy keeping up subsistence, supplies, fuel, etc. It has been found more economical, and generally as satisfactory, to employ constantly only two teams in settled country where supplies can be easily obtained, and where, on moving days, additional teams can be readily hired.

When moving camp, breakfast was served an hour earlier than usual, the men in each tent then packed up their own things and got their own tent down. Certain men were then assigned to the office tent, and others to the cook tent, this latter with the cook's supplies being the last loaded and first unloaded and put up. A start was usually made by 7 a.m. or a little after, and, with fairly decent roads, about 12 miles, the usual distance between camps, was covered, and the camp up by 2 p.m. The remainder of the day was spent by the party in checking estimates and in various office work, making stakes, getting firewood, etc. If necessary, some arrangement was generally made to keep the topographers and leveler working in the field on days when camp was moved, as they usually had some work to do order to catch up.

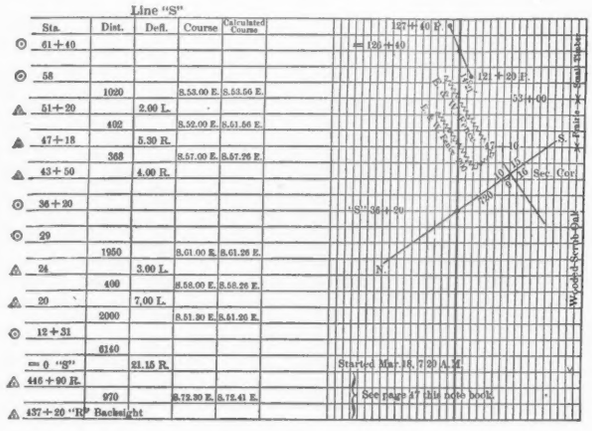


Fig. 1—Preliminary Lines—Transit Notes.

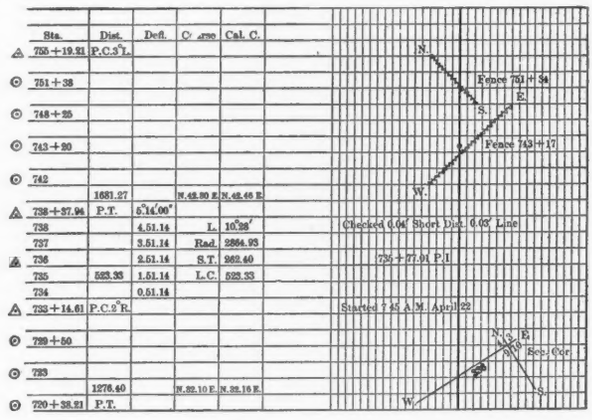


Fig. 2—Final Location—Transit Notes.

Each locating party was organized as follows:

Locating engineer	$150 to	$175
Assistant locating engineer	115 "	125
Transitman	90 "	100
Leveler	80 "	90
Draftsman	80 "	90
Topographers, two	80 "	90
Rodman		50
Head chainman		50
Rear chainman		40
Tapemen, two		30
Back flagman		30
Stake Marker		30
Axemen (3 to 5 as necessary)	25 to	30
Cook		50
Cook's helper		20
Double teams and drivers, furnish their own feed, driver boarded in camp.	65 to	90

Each man was supplied by the company with subsistence when in camp, but was required to provide himself with an army cot and sufficient bedding, and advised to provide a substantial canvas covering for the latter, an ordinary wagon cover, costing from $3 to $5, being the most easily obtainable and most satisfactory. The writer has always insisted, as far as possible, that men should equip themselves properly before starting out. The army cot takes up less

space than any other cot, both when in use and when folded, and, if the bedding is properly protected, much cause for grumbling is removed on account of its becoming wet or dirty in moving camp, or through the tents leaking slightly, as the best will do at times.

Each man's baggage, besides bedding, was limited to about what could be carried in an ordinary suit case; with the large party and equipment it was found that three good double teams had all they could do to move the outfit, and when the roads were bad it was sometimes found necessary to use an extra team.

Each wagon was required to be provided with a heavy canvas cover and at least one spring seat. The prices for teams varied with the locality and season of the year.

The locating engineer was provided with a saddle-horse by the company, and an arrangement was made with the head teamster to feed and care for it.

Much of the success of an engineer in charge of a locating party is due to his ability to handle readily the different characters that go to make up the party. Discipline, tempered with judgment, is of course essential, and a certain amount of formality is necessary. Seats were assigned at the table to each man in the order of his rank, and men were required to occupy their proper seats. Conversation was in no way restricted, provided it was gentlemanly, except that no comments, either of praise or blame, upon the food on the table, were permitted. If any one had complaints they were required to make them to the writer out of hearing of the cook, and, on no account were the men permitted in the cook tent except at meal times.

Frequent inspection of the living tents was made, and it was insisted that each man should make his bed and leave all his things in order before going to breakfast. The men assigned to the living tents were expected to divide between them the necessary chores, required to keep the tent in a clean and tidy condition. In sparsely settled country, considerable attention of this kind is necessary to insure the cleanliness and health of each man; the lazy habits of one should not be allowed to cause unnecessary discomfort to others.

Locating engineers reported directly to the principal assistant engineer. A running account with each was opened with the head office of the railroad, cash being advanced from time to time on requisitions, properly O.K.'d. Provisions were bought by the locating engineer at the most convenient points, receipts being taken for all amounts paid out, and an expense account, on proper blanks, with the receipts attached, was sent in at the end of each month, the amounts of which, after being examined and O.K.'d by the chief engineer's office, being credited to the account at the head office.

It was found best, as far as possible, to establish a credit with one or perhaps two grocers, preferably wholesale dealers, near the proposed route, and deal with them exclusively, buying all provisions in case lots, or unbroken packages, where possible, thus getting wholesale rates.

It was expected that the men would be provided with good wholesome, plain food of the best quality obtainable. As a general rule, fresh meat and vegetables were difficult to obtain, and canned vegetables, dried fruit, and for meats, ham and bacon, had to be relied on to a great extent. While, of course, the final and principal object of the locating engineer is the location of a line of railroad, the fact should not be lost sight of, that good food and enough of it, properly cooked, is a very important factor in keeping up that *esprit de corps* which is absolutely essential to any degree of success in this particular work.

As stated above, the railroad company expected the men to be properly provided for, but, at the same time, locating engineers were expected to see that there was no undue waste. The experience of the writer was that the expense for provisions for such a party as noted above should be between $250 and $300 per month, and any material increase over the latter amount should be questioned. In many instances, with his and other parties, it was found that a change of cooks often resulted in a large diminution in the expense account, with no difference in the quality or quantity of food provided. It was often found that the better cook was apt to be the more economical. Men to whom problems of the commissariat were new often bought supplies in too small quantities, thus paying as much as 10 per cent. more than was necessary.

Line "S"

Sta.	B.S.	F.S.	H.I.	Rod	Elev.	
					749.20	March 22. Started B.M. 30 ft. L. of 4.39+40 R. on White Oak
	10.24		759.44			N° Bk. 14 page 89
S.. 0				6.2	53.2	
1				8.3	51.1	
+35				10.4	49.0	
+40				10.8	48.6	
2				8.4	51.0	
3				4.1	55.3	
T.P		1.06			753.38	On large boulder 3 R. of 3+45
	7.48		765.86			
4				5.4	60.5	
+65				1.1	64.8	
5				3.2	62.7	
6				5.1	60.8	
+30				7.8	58.1	
+60				10.1	55.8	
7				9.3	56.6	
8				8.1	57.8	
9				6.2	59.7	
T.P.		6.23			759.63	Peg at Sta. 9
	9.54		769.17			769.17 / 749.20 / 19.97
10				6.4	62.8	
	27.26 / 7.29 / 19	7.29				

Fig. 3—Typical Page of Level Notes.

The expenses of the parties, as noted in the tables of cost on page 894, show costs varying from $220 to $250 per month for provisions alone; the writer, however, has never made a conspicuous record for economy in the matter of buying provisions, opinions on what is proper and what is luxurious varying greatly; but, as with other things, the conditions of each case govern that case, and a happy mediuum should be striven for.

Where the whole party is made up of well-educated and trained professional men, with the exception of the axemen, higher standards of living will be expected. Engineers on such surveys average, for week after week, 100 to 110 hours per week of actual work, as contrasted with 45 to 48 hours for the ordinary business man or office engineer, and the extra cost of providing them with whatever comforts can be reasonably obtained ought not to be objected to.

The expense accounts were carefully examined each month as sent in, and long experience and the many men in the field enabled the assistants at headquarters to determine very closely the reason for any particular account being above the average, and thus call the attention of the locating engineer to the cause in a definite manner.

The following is a list of groceries actually bought on starting a camp:

6 hams.	1 gal. molasses.
6 pieces bacon.	1 case condensed milk
50 lb. fresh beef.	1 doz. tomato catsup.
1 case eggs.	¼ doz. Worcestershire cause.
25 lb. butter.	1 gal. pickles.
25 " lard.	3 bottles lemon extr.
100 " flour, hard wheat.	3 bottles vanilla extr.
100 " flour, soft wheat.	1 box dried prunes.
100 " sugar.	5 lb. raisins.
5 " baking powder.	4 doz. assorted canned fruits.
2 " tea.	1 case tomatoes.
50 " coffee.	1 case corn.
50 " navy beans.	1 bush. potatoes.
25 " lima beans.	1 kit salt mackerel.
12 " buckwheat flour.	20 lb. salt.
5 " macaroni.	¼ " mustard.
35 " cornmeal.	1 " pepper.
1 cheese (abt. 15 lb).	1 qt. vinegar.
12 packages oatmeal.	6 yeast cakes.
10 lb. rice.	
100 cakes soap.	

Most of the lines to which the following methods most closely apply ran through a rather badly broken up, rolling country, with short cross-drainage, about three-quarters being wooded, and, in Indian Territory, very sparsely inhabited.

The low grades desired, 0.5 and 0.6 per cent., compensated for curvature, and the nature of the country involved considerable study of a rather wide range on either side of the proposed general direction of the line. No Government topographical maps of the country had been issued, and the only maps available were those published by the Public Lands Survey, showing fairly accurately, in relation to the section lines, the general location of the larger streams and rivers and some of the main roads.

On a proposed line of about 300 miles in length, a general route was established from previous reconnaissances with certain towns as governing points. Five locating parties were placed in the field, each assigned to about 60 miles. The results desired to be obtained on the location were:

First.—To establish the fact that a practical line could be obtained with ruling grades of 0.6 per cent., or if not, what was the lowest practical ruling grade that could be obtained;

Second.—To be sure that the line obtained was such that no other line could be built through the same country with the same or better ruling grades, with less expenditure, at the same unit prices;

Third.—To keep close control of the work and results of all the parties from a central headquarters;

Fourth.—To have, on the completion of the survey, complete right-of-way maps, estimates of quantities and cost, profiles showing in detail the exact nature of the work, so that contractors could bid intelligently, and work be started at once if necessary;

Fifth.—To keep the cost of the surveys as low as possible consistent with obtaining the above results.

As stated, it was first desired to establish the fact that a reasonable line could be obtained with maximum grades of 0.6 per cent. throughout the entire route. Each locating engineer, therefore, was instructed to get one line through as soon as possible on which this condition was established, simply noting carefully, but leaving for future investigation other and perhaps better lines or deviations from the line first run.

It is advisable, where possible, for the locating engineer to take a trip over the proposed line before the party gets into the field, but this cannot always be done, as in the particular case referred to. A reconnaissance by the principal assistant engineer, however, had indicated the location of the first camping place and the first work to be done. The party, therefore, was immediately set to work under the direction of the assistant locating engineer, while the locating engineer made a more careful reconnaissance over that part of the line assigned

him, making the round trip of approximately 120 miles in four days.

The trip was made in an open spring wagon; observations with hand-level and compass were taken, and a full sketch was made of the road, showing all branches from it, stream crossings, houses, of which there were few, sketched topography and all the local names that could be learned. Distances were estimated very closely by observing the time of passing all points which could be identified, such as section corners, houses, fences, streams, etc.

On this trip, at the end of the line, which was at a town of moderate size, arrangements were made with a local grocer and provision dealer, so that, when it became more convenient to send to that end for supplies than to the town nearest the starting point, all that would be necessary would be to send the teamster with the necessary order.

In working out the details of the location, nearly the whole time of the locating engineer was spent looking up the general broad features of the country, the actual work of looking after the field party and running the preliminary line devolving practically entirely on the assistant locating engineer.

In laying out the work for the assistant locating engineer, considerable use was made of rough sketches showing the general topography of the country, and, each evening, with the aid of these and the map and profiles of the lines already run, the following day's work was arranged. During the day, the locating engineer found the party at more or less frequent intervals, saw that the line was being run as desired, and made such modifications or revisions of instructions as might be necessary.

It is deemed by the writer most important that the locating engineer should be absolutely free at all times, either to stay in camp and keep the office work up to date, to make reconnaissances for any distance ahead, to be with the party at critical points, in fact, to be wholly in an executive position and not tied down to any details. A conscientious study of the country will keep a good man very fully occupied with this work, with "office hours" from 6 a.m. to 9 p.m., and, by working overtime occasionally and planning the work carefully, he will be able to get a couple of hours sometimes on Sundays to write home to his friends.

In the field, the assistant locating engineer had general charge of the party, and, on preliminary work, was responsible for the proper working out of the details of the line from the general location determined on by the locating engineer. A special point was made of actually running a preliminary line, getting the topography on it and making a projected location and profile wherever there was a reasonable possibility of a good line existing. Especially is this important in wooded country, where the difficulties of comparatively small details are apt to be magnified, and a good location missed because of the actual physical difficulties of getting over the ground, or of sizing up the topography as a whole. In this connection, it is believed by the writer that little time should be wasted in the field in getting the preliminary so close to where the final location may come that it will show up a good profile.

The point of prime importance is to get the preliminary close enough so that the projected location will fall well within the limits of the topography. Of course, the difference between good and bad judgment will show here, as everywhere, but the point is, not to have the party sitting around waiting, and going back to refine the small details on the preliminary; all this can be done to much better advantage on the map, where a broad general view of the whole line can be taken.

On making the final location, the assistant locating engineer obtained from the map the necessary data to connect the located line with the preliminary, and to lay it out on the ground as projected, which data he kept in a notebook used for that purpose only. He had with him in the field a copy of that portion of the projected profile covering the work in hand. The points on the located line were fixed by horizontal distances from the hubs on the preliminary, and also, and especially where the slopes were at all steep, by vertical distances, and points of elevation fixed by the leveler.

It should be noted especially that, in anything like rough country, the essential point, in running in a location from a line projected on a map, is to reproduce the projected profile rather than the projected line. After deciding that the projected profile is the one to be obtained, the location must be passed through all the controlling points whose vertical distance (or, rather, elevation) is such as called for by the projected profile and determined by leveling from some known elevation (a hand-level will generally give close-enough results).

The actual profile obtained by the leveler was platted in the field at critical points and compared with the projected profile to see that the proper results were being obtained. Absolutely correct topography is not required and is not essential, if the vertical method is adhered to in laying down the location. Many engineers have objected to topographical work on a railroad location on account of the expense necessary for accurate topography, but this latter, and the expense incident to it is entirely unnecessary if the locating engineer in charge of the party knows how to place his projection on the ground so as to equalize any slight errors made.

The difference between theory and experience, here, is that theory would require an absolutely accurate preliminary and topography, while experience shows that neither is essential, if proper methods are adopted in getting the line on the ground. The writer believes that many locating engineers lose sight of the fact that the location should bear a certain relation of position to the local topography, rather than a relation to a certain gegographical position on the map.

It was considered advisable to avoid equalization stations, as the result of revisions of the line, as much as possible, and every care was taken to get the line right in the first place. As the preliminary lines form the basis on which, not only the projection of the locations depends, but also of the topographical map, which forms the basis of the final completed record of the survey, it is essential that, without wasting time and money on unnecessary refinements of accuracy, all due precautions should be taken to prevent unnecessary errors.

All angles were checked by doubling and by compass readings, the rear flagman kept a list of all hubs to check the transitman, and the rodman worked out in a separate book all elevations of turning points, thus checking the leveler, this latter being most important.

In settled cultivated country, on both preliminary and location lines, hubs were set at all fences, as both stakes and hubs in the fields are frequently, and, in fact, usually, pulled up or destroyed soon after the line is run, while the hubs at the fences

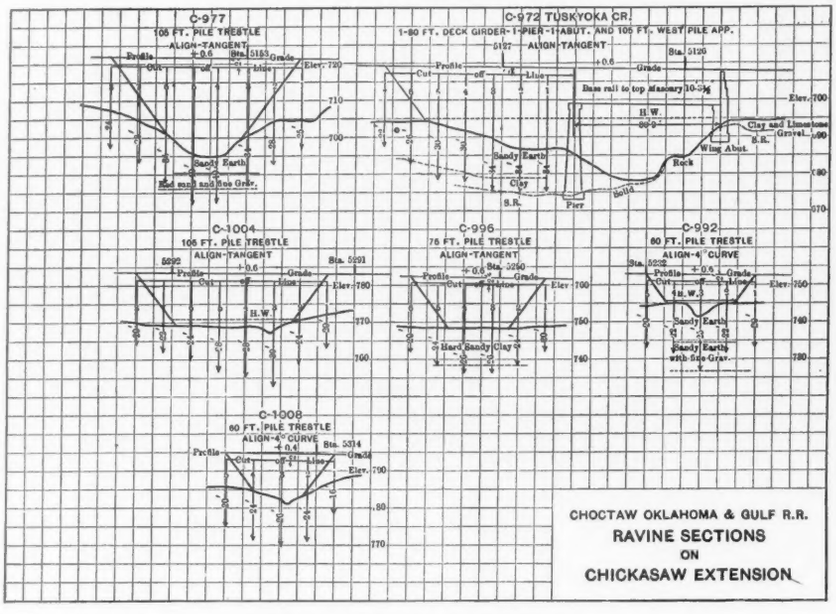


Fig. 4—Ravine Sections on Chickasaw Extension.

The head chainman is responsible to a greater degree perhaps than any other one man in the party for the progress of the work, that is to say, the actual physical progress, after the direction of the line has been determined. He must be a hustler from start to finish and for 10 or 11 hours per day, and, at the same time, be accurate; it is no use being careful about the instrumental work and the platting, if the chaining is not well done, and nothing is more annoying than to plat side lines forming traverses and find that they will not close, or to run in curves on location and not have them check. Chainmen, as a rule, are not college graduates, but are as often picked up in the country where the survey is carried on, and probably

Surveys were made of, and levels run on, all railroads crossed, for one mile on either side of the line.

An exact copy of the transit notes was made every night in an office notebook. Figs. 1 and 2 show typical pages of transit notes on preliminary and final location.

remain, enabling the ready re-establishment of the line. All tangents were run to an intersection, the P. C. and P. T. of all curves being set before the curves were run in.

have had some experience, and there is no point where the engineer in charge of survers can use his time to better advantage at the beginning of the work than in getting the chainman to do good work, not necessarily measuring to thousandths, but accurately enough for the work to be done.

There were three axemen (except in one or two cases of very heavy timber for several miles, where two extra men were put on for a short time); in wooded country, all chopped, but in that more or less open, one man helped the stake-marker by driving the stakes.

The writer has found it advisable to pick out one axeman and place him in charge of the others, spending time enough with him at the beginning of the survey to break him in thoroughly to the idea of keeping on line and cutting only what is necessary to get the line through; the right kind of a man will soon learn what is required, and save a great deal of time.

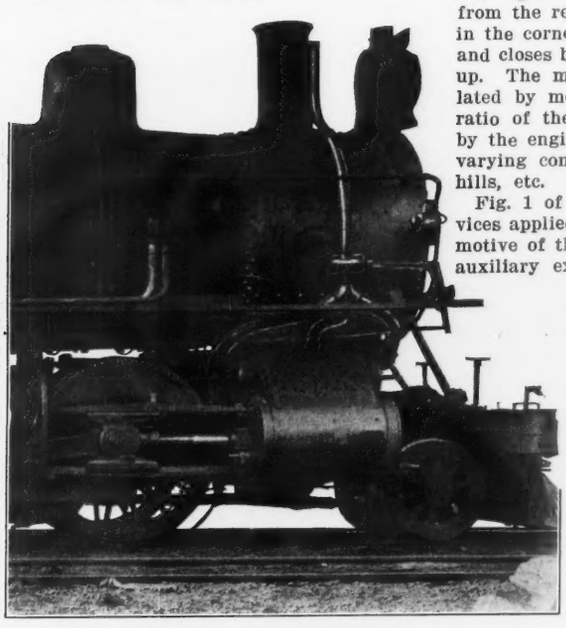


Fig. 1—Variable Exhaust and Drifting Device on Chicago Great Western Locomotive.

Leveling.—Bench-marks were established every mile on preliminary lines and every half-mile on final location, care being taken to have these latter convenient for construction purposes, especially near bridge openings, etc., and away from all danger of being interfered with by the excavation. The elevation of each bench-mark was plainly marked on or near the same. Level notes were kept in the form shown in Fig. 3.

On the final location at all bridge openings ravine sections were taken, all plusses being measured in with a cloth tape, and a very careful profile was obtained which was afterward platted on a scale of 10 ft. to 1 in. (see Fig. 4).

NOTE.—In using the metric system, stakes are driven every 20 m., and numbered from the beginning, 0, 2, 4, 6, 8, 10, etc. Curves are run in, the same as when using 100-ft. stations, except that the deflections are for 20 m. instead of 100 ft.; as 20 m. equals very closely $\frac{2}{5}$ of 100 ft., the radius of an 8° curve metric equals approximately a 12° using 100-ft. chords. Tables of radii of metric curves are given in Henck and elsewhere.

Levels are taken as usual, ordinary readings to centimeters and target readings to millimeters. Profiles are platted on metric profile paper, the smallest divisions being millimeters, giving a profile, at the scale ordinarily used, about the same as that platted on Plate B paper.

Maps are usually platted on a scale of 1:5,000, about equal to 400 ft. to 1 in.

(To be Continued.)

It is not alone in America that railroad and other earthwork, etc., is done chiefly by Italians, but in pretty much all Northern Europe west of Russia. They usually go home to winter, and in November the number of these returning Italians is so great that the Gotthard Railroad puts on special trains for them, sometimes as many as three in one day.

A Variable Exhaust and Drifting Device.

A device for varying automatically the exhaust of a locomotive at the valve has been patented by Mr. F. O. Whealon, of St. Paul, Minn. In connection with the variable exhaust is another device called a "drifter," to relieve back pressure in the cylinders when the engine is drifting. The combined device is applied to the outside of the locomotive and therefore has the advantage of being free from the injurious influences affecting devices placed inside of the smokebox. The exhaust device is not operated by the engineman, but is worked automatically from the reverse lever. When the latter is in the corner the relief valve is wide open, and closes by degrees as the lever is hooked up. The movement of the device is regulated by means of a turn-buckle; also the ratio of the relief exhaust may be varied by the engineman at any time to meet the varying conditions of a run, such as long hills, etc.

Fig. 1 of the illustrations shows the devices applied to a heavy simple freight locomotive of the Chicago Great Western. The auxiliary exhaust being outside and operative when the engine is working heaviest, the withdrawal of a part of the steam from the nozzle reduces the severity of the draft, and consequently the tearing effect on the fire. Fig. 2 is a sectional sketch of a cylinder and valve showing the exhaust and drifter attachments in combination, the latter being at B and joined to the auxiliary exhaust pipe. It is said that the combined device is easily and quickly applied, less than a day being needed. It can be applied to any type or class of locomotive.

Reports of the performance of Chicago Great Western locomotive No. 249—the one in the illustration—signed by Mr. John Birse, Division Master Mechanic, are favorable. The reports include records of horsepower as shown by indicator tests, comparisons of the performance of the locomotive before and after applying the devices, and

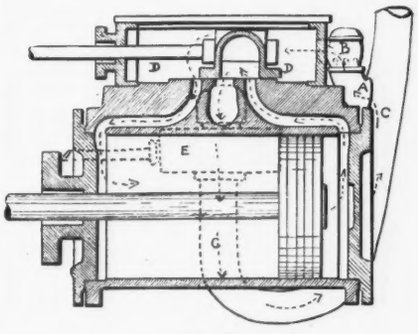


Fig. 2.

comparison of coal consumption between the 249 and two compounds without the devices, all in the same service. In all of these cases the figures show considerable savings due to the devices. The devices are also on trial on the Duluth, South Shore & Atlantic. The devices are controlled by the International Railway Device Company, St. Paul, Minn.

Tractive Resistance of Loaded Railway-Wagons.*

BY J. A. F. ASPINALL, M. INST. C. E.

The following is an account of some experiments made to determine the tractive resistance of 10-ton, 20-ton and 30-ton railway-wagons, loaded to their full capacity. The experiments were carried out chiefly on straight track, a few only being made on a curve.

The wagons experimented with were:

	Total weight—Tons.	Cwts.	Qrs.
6 10-ton wagons, 9-ft. wheel-base, with grease-boxes.....	94	5	1
6 10-ton wagons, 12-ft. wheel-base, with oil-boxes	99	7	1
3 20-ton wagons, with oil-boxes,...	84	18	3
2 30-ton wagons, with oil-boxes...	88	14	3

—each train being loaded with 60 tons of pig iron. The various wagons employed are illustrated in Fig. 1.

The experiments were made on the Lancashire & Yorkshire Ry. between St. Luke's Road and Burscough Bridge, this being the most suitable place owing to the nature of the permanent-way and the exposed character of the surrounding country. The experiments on the curve were made at Barton, on the St. Luke's and Hillhouse branch. The curve forms almost a quarter of a circle, of 1,820 ft. radius, and is on the level.

In carrying out the experiments on the straight track, a dynamometer-car was used. The positions of the throttle and the reversing-screw on the engine were marked for each trial and were not altered during the whole of the run, thereby eliminating the acceleration which would be caused by altering the power of the engine. On this line, where the gradients are very slight, constant speeds could be maintained for two or three miles. On the curve the wagons were propelled by an engine until the desired speed was attained; the wagons were then slipped and allowed to travel round the curve, the distance travelled being marked every 10 seconds until the vehicles passed off the curve. In order to determine the relative resistance of each train, it was decided to run the trains at speeds varying between 30 miles an hour and 50 miles an hour, as lower speeds would not show a sufficient difference between the resistances, on account of the small weight of the trains. On the straight, 10 trials were made with each train, in order that a fair idea of the comparative resistance of the different trains experimented with might be obtained.

The results of the experiments made on the straight are plotted in Fig. 2, and it will be seen that the resistance per ton is highest with the 10-ton wagons of 9-ft. wheel-base, which were fitted with grease-boxes. When hauling this train the wagons were in a constant state of oscillation, which would augment the resistance considerably. The 20-ton wagons ran very steadily, but the high resistance per ton may be accounted for by the area exposed presenting a more effective surface to the wind. The 10-ton wagons of 12-ft. wheel-base, which were fitted with oil-boxes, ran exceptionally well both on the straight and on the curve, this being noticed while the trials were in progress and before the results had been tabulated. It will be seen that the curve closely approaches that for the 30-ton wagons, indicating either the easy running of the 10-ton wagons or the high resistance of the 30-ton wagons. From observation it was concluded that the resistance of the 30-ton wagons was rather high when going round curves, owing to the excessive deflection of the bolsters, due to the load, causing the side bearings to bear hard on the

*A paper presented to the Institution of Civil Engineers and reprinted from the *Proceedings*, Vol. 158, part 4.

truck and prevent it turning with sufficient ease. This fact is also shown by the results of the run on the Barton curve, plotted in Fig. 3, the 10-ton wagons having a resistance of 1.3 lbs. per ton less than that of the 30-ton wagons. But, since it is the horse-power required to haul a paying load that has to be taken into account, these resistances must be taken in conjunction with the load hauled. Thus, since the ratio of the load carried to the tare is,

For 10-ton wagons of 9-ft. wheel-base	1.75 to 1
" 10-ton " " 12-ft. "	1.52 " 1
" 20-ton "	2.4 " 1
and for 30-ton wagons	2.09 " 1

it follows that if the resistance per ton were equal the 20-ton wagons would require the least power to haul a given load, the 30-ton wagons a little more, the 10-ton wagons of 9-ft. wheel-base still more, and the 10-ton wagons of 12-ft. wheel-base the most of all; but it will be seen that the resistances vary in quite a different ratio. At 40 miles an hour they are the following:

	Lb. per ton.
For 10-ton wagons of 9-ft. wheel-base	16.35
" 10-ton " " 12-ft. "	12.8
" 20-ton "	14.4
and for 30-ton wagons	12.4

Taking these in conjunction with the load hauled, it is found that at 40 miles per hour the power required to haul 60 tons of paying load is,

For 10-ton wagons of 9-ft. wheel base	164.3 h.p.
" 10-ton " " 12-ft. "	135.5 "
" 20-ton "	130.3 "
and for 30-ton wagons	117.4 "

Or, the power required per ton of paying load at 40 miles per hour is,

	H.p. per ton.
For 10-ton wagons of 9-ft. wheel-base	2.74
" 10-ton " " 12-ft. "	2.26
" 20-ton "	2.17
and for 30-ton wagons	1.96

It is obvious, therefore, that for a given load the 30-ton wagons can be hauled with less power than those of any other class, and although the 20-ton wagons have a resistance 1.6 lbs. per ton greater than that of the 10-ton wagons of 12-ft. wheel-base they can be hauled with less power. It will be noticed that there is a very considerable difference between the power required for the 10-ton wagons of 9-ft. wheel-base and that for those of 12-ft. wheel-base, the former being nearly one-half horse-power per ton greater than the latter.

In plotting the results it was found that they varied considerably for the same speed, owing to the wind-pressure on the cars. It was observed, however, that if they were plotted to a common basis representing the speed of the train relative to the air, the results were more comparable. The chart (Fig. 2) is therefore made in this manner, the velocity of the wind against the train being taken as the speed of the train. It will be noticed that length on the diagram represents the actual speed of the train if there is no wind.

The diagram (Fig. 3) showing the resistances on the curve represents the mean of three experiments; height on the diagram representing loss of speed in a given time. The resistances have been calculated from the loss of energy due to this reduction of speed.

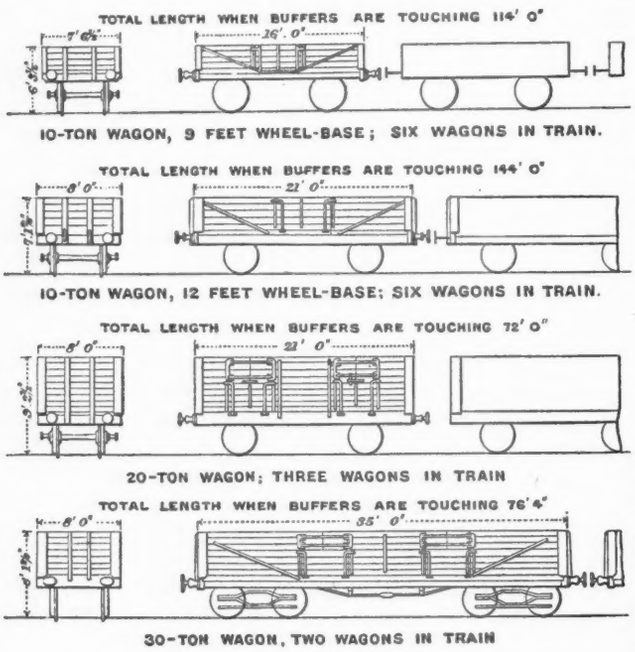

TOTAL LENGTH WHEN BUFFERS ARE TOUCHING 114' 0"
10-TON WAGON, 9 FEET WHEEL-BASE; SIX WAGONS IN TRAIN.
TOTAL LENGTH WHEN BUFFERS ARE TOUCHING 144' 0"
10-TON WAGON, 12 FEET WHEEL-BASE; SIX WAGONS IN TRAIN.
TOTAL LENGTH WHEN BUFFERS ARE TOUCHING 72' 0"
20-TON WAGON; THREE WAGONS IN TRAIN
TOTAL LENGTH WHEN BUFFERS ARE TOUCHING 76' 4"
30-TON WAGON, TWO WAGONS IN TRAIN

Fig. 1—Wagons Used in Making Tests.

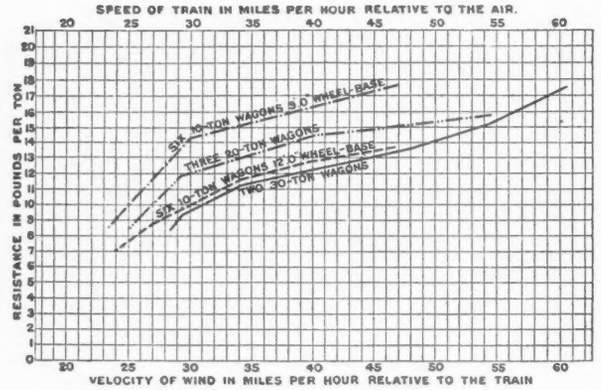

SPEED OF TRAIN IN MILES PER HOUR RELATIVE TO THE AIR.
RESISTANCE IN POUNDS PER TON
VELOCITY OF WIND IN MILES PER HOUR RELATIVE TO THE TRAIN
SIX 10-TON WAGONS 9'0" WHEEL-BASE
THREE 20-TON WAGONS
SIX 10-TON WAGONS 12'0" WHEEL-BASE
TWO 30-TON WAGONS

Fig. 2—Train Resistance Curves on Straight Track.

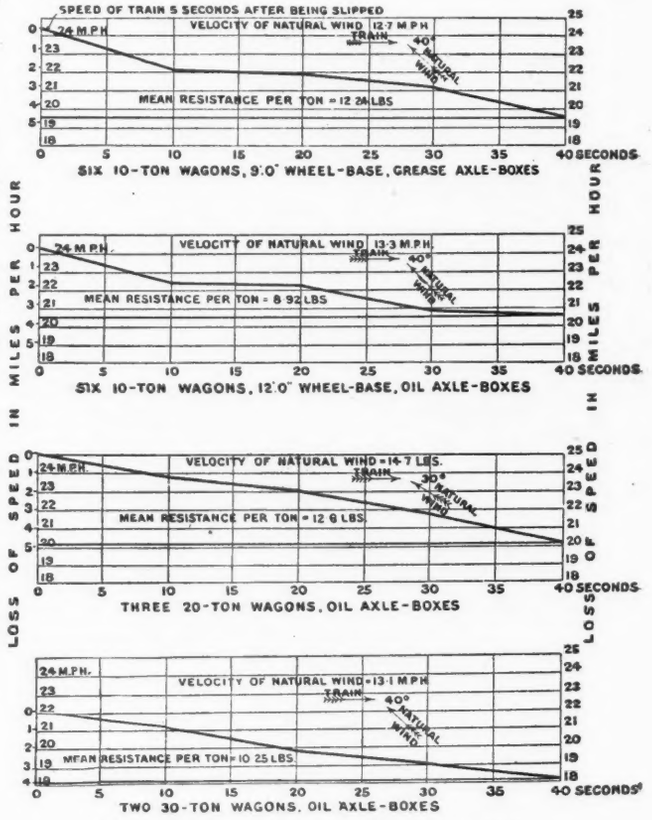

SPEED OF TRAIN 5 SECONDS AFTER BEING SLIPPED
VELOCITY OF NATURAL WIND 12.7 M.P.H.
MEAN RESISTANCE PER TON = 12.26 LBS
SIX 10-TON WAGONS, 9'0" WHEEL-BASE, GREASE AXLE-BOXES
VELOCITY OF NATURAL WIND 13.3 M.P.H.
MEAN RESISTANCE PER TON = 8.92 LBS
SIX 10-TON WAGONS, 12'0" WHEEL-BASE, OIL AXLE-BOXES
VELOCITY OF NATURAL WIND = 14.7 LBS.
MEAN RESISTANCE PER TON = 12.6 LBS.
THREE 20-TON WAGONS, OIL AXLE-BOXES
VELOCITY OF NATURAL WIND = 13.1 M.P.H.
MEAN RESISTANCE PER TON = 10.25 LBS.
TWO 30-TON WAGONS, OIL AXLE-BOXES
LOSS OF SPEED IN MILES PER HOUR
SECONDS

Fig. 3—Test of Wagons Drifting on Curve.

The Passenger Department.

Mention of the establishment by the University of Chicago of evening courses in railroad transportation was made in our issue of November 25, and an outline of the proposed work given. On December 6, Mr. P. S. Eustis, Passenger Traffic Manager of the Chicago, Burlington & Quincy, delivered an address on The Passenger Department, treating his subject under four heads: (1) What it is to-day. (2) Its importance. (3) Some problems. (4) What it should be. Extracts from the address follow:

The passenger department, some railroad officials have said, is like the appendix; of no apparent use and a great deal of trouble. Some people say it is a bureau which makes rules and arranges train service expressly to annoy and inconvenience the public. There is provocation for both these statements. . . .

On most railroads the passenger department prints the tickets and distributes them to agents, fixes the rates of fare and advertises for patronage. The baggage department is usually a bureau of the passenger department; in fact, on some railroads the head of the latter is the head of both. On some railroads immigration work is in charge of the passenger department and on others it is a separate department altogether. Some roads include as a bureau of the passenger department the commissary for the operation of dining cars, and this sometimes extends to the operation or oversight of eating houses. On a few railroads the general passenger agent also has supervision of the mail and the express traffic, each of which is a business of considerable importance and has a necessary connection with the passenger train service. . . .

That the passenger department is an important division of the railroad is clear when we realize that we have 207,000 miles

of railroads in this country carrying nearly 700 million passengers one mile annually on passenger trains running nearly five billion miles, earning a revenue for the railroads of nearly 520 million dollars, of which more than 80 per cent. is for the transportation of passengers, and the balance is the earnings from miscellaneous traffic such as express, mail and baggage; the total earnings of passenger trains being approximately 27 per cent. of the total earnings of the railroads.

There is great variety of conditions under which the passenger department operates. It is one thing in New England, New York and Pennsylvania, where the population is 750 people to the mile of road, and a very different question in the West, in Nebraska and Colorado for instance, where the population is but 150 to the mile of road.

In New England the passenger earnings of the railroads are more than 44 per cent. of the total revenue; on the New York, New Haven & Hartford about 49 per cent. of the whole are passenger earnings. But on what is called the southwestern group of roads, those in Texas, Oklahoma, New Mexico, etc., the passenger earnings are but 23 per cent. of the total.

There is a like wide difference in the passenger earnings per mile of road and the earnings per passenger train mile.

	Passenger earnings— Per mile of road.	Per train-mile.
New England roads, Group 1	$6,065	$1.27
N. Y., N. H. & H. R. R.	11,268	1.42
Southwestern roads, Group 9	1,354	1.10
M., K. & T. Ry.....	1,274	.85
Average for the U. S.	2,523	1.08

. . . In a business of such magnitude, conducted under conditions varying according to the size of the road and the territory which it serves, the difficulties are many and the problems important. I will outline a few on one of the western railroads. The first in importance is train service. The passenger agent soon learns that he may not run only such passenger trains as will earn the most money per mile of railroad at the least expense; the freight department would suffer if he did. In one place, for instance, the road would lose a great deal of livestock shipments unless the passenger department furnishes an evening train on which the stock shipper may return free from his market to his home; a train for which there is perhaps inadequate paying traffic. In another place where a daily passenger train earns but little, as the towns are small and the district agricultural, he must run a service which the traffic will not warrant, else the people will ship their merchandise in and their products out by rival railroads. Moreover, if this district is not easy of accsss by passenger service for land seekers and business men hunting new locations, it will not grow as it should; and thousands of miles of our western railroads were built, in fact are now located, in sparsely settled regions of the kind. The question of today's passenger train service is not so much one of what will pay now as what will best develop the country for future profit.

Mention is then made of the different kinds of "free business" such as the host of employees moved, also their families; stockmen, newspaper men, etc., the free list often aggregating 10 per cent. and more of the entire passenger business of the road. This is all charged against the passenger department.

Continuing, the paper says: As a rule the discussion of results starts with a rather poor average per train mile and the head officer immediately raises the question, "Are we not wasting money in running such fast and such handsome through trains?" But a careful review of the average earnings of each train quickly leads to the discovery that the trouble with the general average is not with *those* trains, but with a host of trains earning far less than the average of the whole, which are run chiefly to protect the interests of the freight department, or not for present profit or real need now, but for the purpose of developing a new country.

Another difficulty is that of rates. The manner in which we conduct all business in this country is sufficiently astonishing, and our railroad business methods are not the least striking. It is, it must be, like our agricultural business, of wonderful vitality to stand the strain of so much that is foolish and wasteful in its conduct. To me one of the most foolish things in the conduct of our railroads is the manner of making rates. The law in most states fixes a maximum passenger rate at so much per mile and an important function of the passenger agent is to make his reductions from this figure with good reason; that is for the greater profit of the road. By the use of the legal rates per mile or by agreement between competitive lines, or by some other method, a very reasonable and proper set of standard and regular rates is arrived at, but the lack of good business sense seems to be shown in the matter of reducing them for cause. Rates are very sensitive. An apparently sensible and business like reduction from the standard rate may be made for the movement of some business in Illinois to-day, with the result of establishing a similar basis of rates later on in Nebraska, in a case where there is no good business reason for it. I have often referred to an extreme case illustrating the sensitiveness of rates which occurred some years ago. The roads from Missouri and Southeast Kansas made certain excursion rates to the Merchants Fair, or fall festivities, in St. Louis. That led to other roads making other rates from contiguous territory to St. Louis and to other points and the influence quickly spread until, as a matter of fact, a certain absurd and unbusinesslike reduction in rates was made from St. Paul to Boston because of the fact that certain apparently business-like and sensible rates were made from Joplin, Mo., to St. Louis.

It is, therefore, in exercising this function of reducing rates that the passenger agent so often errs. In his effort to seek new traffic for his road by reducing the standard rates, he frequently fails to take account of their effect upon all existing traffic or the traffic of the future, in that or other districts in which he is interested. This unbusinesslike proceeding is not, however, peculiar to passenger agents; it is often practiced by freight agents and by higher officials.

The rate of fare between two points being fixed by one means or another, there is no way of maintaining it. It is only maintained so long as it is to the interest of each road to do so. The obligation on the passenger department to reduce rates for profit, and the inability in any way to maintain rates, is a constant source of trouble, one of the great troubles we have. The public knows this and often seeks to make it to the interest of one of several competing lines to cut the rate, sometimes by means of an offer to concentrate on one line the major portion of business moving to a large convention, passengers who would otherwise divide their patronage among all the roads. More often, however, the suggestion to cut rates comes in the shape of a false and perhaps dishonest report that a competing line has offered a concession. There is no man so credulous of such false reports as is the average passenger agent, and as there is no fixed cost for transportation, passenger agents often seek advantage over their competitors by cutting rates secretly or otherwise, trusting to the Lord that each such cut will bring extra business to already scheduled trains and will have no concurrent bad effect upon existing traffic nor upon the business of the future. In other words, dishonest travelers and shippers consider the railroad a proper "graft" and the contracting agent a soft mark, and he is.

There is keen competition between the roads in almost every part of this country, notwithstanding all that we say about community of interest and mergers; also this is a day of specialties.

A good passenger department may be outlined as follows:

(1.) The head of the department should have real charge of passenger train service and all the traffic that is handled on it.

(2.) He should constantly confer with and co-operate thoroughly with the freight department, the more important revenue department of the road, and arrange the passenger train service with the entire interest of the road in mind.

(3.) He should have no responsibility for the movement of trains whatever. But he should be required in every particular not only to co-operate with the operating department, as with the freight department, in arranging passenger train service, but to leave the handling of it to the operating officials.

(4.) He should have a rate bureau which shall not have authority to make rates, but simply to compile tariffs upon bases laid down by the chief, which bureau should be the only official source of rate quotations.

(5.) His advertising bureau is important. A most ordinary piece of work from that department is the issue of the public timetables. These usually give a list of agents who will explain what they mean, but real advertising, that which draws public attention to the road as a carrier, is quite an art. Much money has been spent in advertising which accomplishes nothing and only recently have the roads commenced to specialize that bureau, but some of the roads who do that, while keeping strict account of all advertising paid for in cash, take no account whatever of the cost of advertising which is paid for in transportation. Naturally this results in the issue of advertising tickets in large numbers to buy advertising which is next to worthless. The chief should carefully block out whatever appropriation he has at his command for the year, what work is to be done by the advertising department in each special district, and how it is to be done; so much in newspapers, so much in billboards, so much in booklets, folders, signs, maps, etc.

(6.) A soliciting force. These should be men who are posted about the road for which they work and not merely selected because they are good talkers, or liars. It is necessary to travel constantly to give information to the agents who have to sell the tickets, and to call upon the intending passenger in response to inquiries.

(7.) An immigration bureau. The importance of this varies, it is true, on the different roads, but almost any western road has sparsely settled, partly developed territory, and an immigration bureau is necessary for that purpose. That any road's interests in that respect require careful attention is evidenced by the fact that an Indiana man will move to Texas or Montana, according to the manner in which he happens to be solicited.

(8.) The baggage department. Our system of checking baggage in this country is easy for the passenger, and, all things considered, works very well, but the baggage department is necessary to keep it going straight.

(9.) The commissary department is, on a great many railroads, considered so special

that it is not a part of the passenger department, but as it does not pay expenses on any railroad, and it brings business or otherwise, according to whether or not it is run to suit the traveler, it appears to me very necessary that it be just as much a part of the passenger department as is the baggage department.

(10.) Mail and express traffic should be a bureau of this department. True, the mail compensation is fixed by law and the usual express arrangement is a contract for so much space or a percentage of the express company's gross receipts, yet this is traffic moved almost wholly on passenger trains. Mail, express and passengers all have their special needs on these trains, but the passenger traffic is the important part, and unless we have all three considered jointly, something is going to suffer; undue weight will be given to the claims of one to the detriment of the others.

Without attempting to go into details to the extent of suggesting how many titled assistants would be necessary to carry out such a plan, I have given this outline as much to show how the passenger agent should classify his business and duties, as to show what he should have charge of and what he should be responsible for.

If the passenger agent has his organization and his responsibilities well outlined in some such way he can readily control the business of his department, and if it is not a success from every reasonable point of view, the fault is his alone; and in case of failure it will, I think, be found to be due to the fact that he does not get statements enough and sufficiently study the business of the day. He allows too many subordinates to make rates for him, when he should himself see that every tariff is made and every departure from a standard rate is made for what appears to be good reason, after careful consideration, or he has a host of traveling agents in the field, at a large expense, from whom he requires no regular reports showing where they have been, what they have been doing and what the results are. He has arranged his train service on an extravagant basis or in a manner unsatisfactory to the public, without proper conference with district and local passenger agents, superintendents, conductors, trainmasters and other employees who are on the ground and can give the best advice. He may not receive, or if he does he may not study, the monthly statements showing the earnings per mile of every passenger train run on the road, compared with the past, and the receipts for ticket sales at every station. He may have spent several hundred thousand dollars in advertising without any definite plan for its use here or there where it is needed and will count. He probably has no time to study carefully the arts of wording an advertisement to attract the public notice, and employs for that purpose a worthy man who does not know any more about it than he does. He may have issued millions of miles of free tickets during the year without reckoning that it is an expense, with the result that as he placed no value upon what he gave, he got little value in return.

These may appear to be exaggerations of the faults and difficulties in the conduct of a passenger department. They are only the leading mistakes we make and I mention them deliberately and advisedly.

Siam having a little railroad to build, asked for bids for materials, rolling stock, etc., and received them from 20 British, 11 German, nine Belgian, two Austrian, one French, one Dutch and one Italian concerns. Two Belgian establishments got the orders. The engineer is a German.

W. H. Baldwin, Jr.

William Henry Baldwin, Jr., President of the Long Island Railroad, died at his home at Locust Valley, L. I., on Tuesday morning, January 3. Mr. Baldwin had been an invalid since the middle of last summer, and had been lying critically ill in a hospital for four months. Mr. Baldwin was born in Boston in 1863, and was graduated from Harvard University in 1885. Two years later he began his railroad career on the Union Pacific, where he was division freight agent at Butte, Mont. From that position he was promoted to be Assistant General Freight Agent, with headquarters at Omaha. After about a year he was made Manager of the Leavenworth Division and soon after was promoted to be General Manager of the Montana Union. From here he was again promoted to be Assistant Vice-President of the Union Pacific, but in 1891 he left that road and went to the Flint & Pere Marquette, where he was General Manager for three years and then Vice-President for about two years more. In 1895 he left the Pere Marquette and went to the Southern Railway, where for two years he was Second Vice-President. On leaving the Southern, he went directly to the Long Island road and has been President

W. H. Baldwin, Jr.

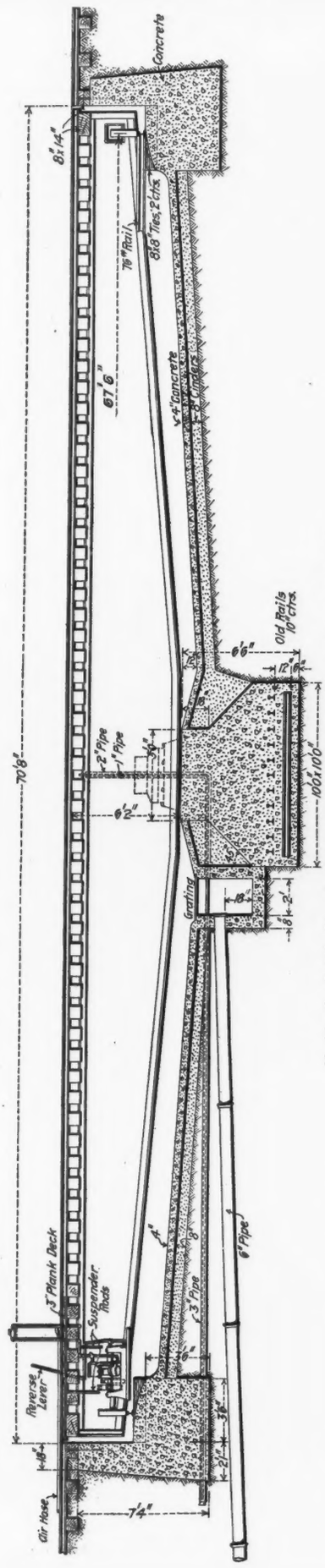
of that company ever since. Mr. Baldwin was President of the company formed by the Pennsylvania to build the tunnel across Manhattan Island and beneath the Hudson and East Rivers, the Pennsylvania, New York & Long Island Railroad Company. He was also a Director in a number of insurance companies, banks and other establishments. Mr. Baldwin leaves a widow, one son and one daughter.

As a railroad man he was one of the results of the effort of Mr. Charles Francis Adams to introduce university-bred men into railroad life. The indications of executive power which Mr. Baldwin had shown in his undergraduate days were not misleading, and he soon revealed to those who saw him close to, genuine qualities of leadership. He was a young college man, and a Christian gentleman, and Butte was one of the wickedest towns in the world, but Butte soon came to respect and trust Baldwin just as Tammany did years later. When he took hold of a job he enlisted for the war, and he enlisted to win, and he intended to stay until he did win, which he generally did. It will be remembered that shortly before the Long Island Railroad passed to the control of the Pennsylvania Mr. Baldwin was made Chairman of the Committee of Fifteen, which began war on certain horrible forms of vice and crime in New York. The committee had to attack the personal interests and fortunes of men powerful in New York politics. To many of Mr. Baldwin's friends it seemed impolitic that he should identify himself with that committee. It seemed as if the company of which he was president would probably suffer from the certain hostility of strong but semi-criminal politicians. It seemed that Mr. Baldwin's reputation for discretion and sagacity was bound to suffer amongst the financiers of the city. After the Pennsylvania took control of the Long Island Mr. Baldwin offered his resignation, for he intended to stay with the Committee of Fifteen until that work was done, whether the railroad men and financiers liked it or not. But Mr. Baldwin was dealing with a man of great breadth and moral courage, and he was told to go ahead with his Committee of Fifteen and also to keep his railroad position. Looking back now it seems likely that Mr. Baldwin and Mr. Cassatt were wiser than those who would have recommended a less daring course. It seems probable that the confidence and respect which Mr. Baldwin inspired amongst the New York politicians during this work for civic cleanness enabled him to deal with them as a weaker man, or a man whom they did not know and fear and trust, could not have done.

This quality of devotion really lies at the bottom of the motive which induced Mr. Baldwin to leave the Southern Railway for the presidency of the Long Island. At that time it seemed to many people that it was a mistake in a professional way and in a business way for Mr. Baldwin to change from the great corporation to the small one, and he himself regarded it as a step backwards professionally, but it was not a mistake; it was deliberately done for the sake of one person whose comfort and welfare were of more importance to him than his profession and career.

Mr. Baldwin's keen desire to better the condition of mankind, which was a constant force in directing the activities of his energetic life, led him to much useful educational work in the south. His experience on the Southern Railway quickly revealed to him the imperious demand for this work, not only amongst the negroes, but also amongst the poor whites. He recognized that the moral and intellectual improvement of those people was a matter of great consequence to the whole nation; that it should be treated as an immediate measure of practical statesmanship, and he gave to this cause not only his money, but his labor and his love. Booker T. Washington had no friend more constant and more helpful than William H. Baldwin.

Mr. Baldwin was keenly interested in his work as a railroad officer. He loved the smell of the coal smoke. He loved to be where hard work was being done. He was pre-eminently a man of action; but when larger interests compelled him to become more a man of finance and negotiation he did not disappoint his friends. He was keen, resourceful and resolute. As a negotiator he would have been greater if he had not been quite so much of a partisan. If he had been a little more compromising, and a little less determined to get everything that he went after, he would undoubtedly have got more in the end, but his temperament made him uncompromising, and even willful. He was a man of clear and powerful mind, of quick apprehension and extraordinary rapidity of decision, and he was absolutely without fear. He would have been a great soldier. In a way his fearless-



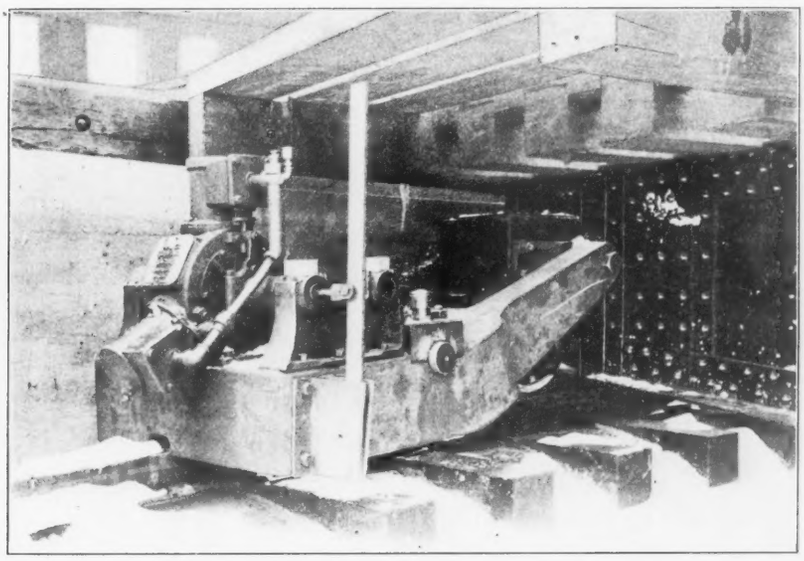
N. Y., O. & W. Standard Turntable as Equipped with Air Motor.

ness was one manifestation of the beautiful rectitude and simplicity of his life. His purposes were so high, and his whole life and conduct so entirely sincere and correct that he really had nothing to be afraid of. In his fierce and intolerant singleness of purpose he sometimes made mistakes, but his fine intelligence kept nim from being foolish or fanatical. He had the defects of his temperament; that is, he was quick to find fault, hasty of speech and action; but he had also qualities of generosity and magnanimity which far outweighed these defects.

It is a great misfortune to lose out of the world a man like Baldwin; so young and so powerful in mind and body, and having such noble aspirations. With his high ambitions, his sound character and his great qualities he might have gone anywhere in the profession which he had chosen, and whatever he did would have tended for the betterment of mankind.

N. Y., O. & W. Standard Turntable, Equipped with Air Motor.

The accompanying illustrations show a turntable which has just been completed by the New York, Ontario & Western at Middletown, N. Y. The table is 70 ft. in diameter and is of the roller bearing type. It was made by the American Bridge Co. and is operated by an air motor made by the Tatlow Turntable Attachment Co., Denver, Col. The air for operating this table is supplied from the engine house through a 1 in. pipe which enters the center of the pit, whence it goes up through the center pier to a universal joint on the deck and thence to the air motor. When a turntable fitted as shown is not located near an engine house, air for operating the motor can be taken direct from the locomotive, which is being turned, by means of an ordinary air coupling, connected as shown in the line drawing. Thus the locomotive furnishes its own power for turning and it is not necessary to have a man stationed at the turntable for operating the air-motor, as the engineer or fireman of the locomotive can attend to the same. When a turn-table is to be operated at all times direct from the locomotive it is not necessary to have a pipe through the center of the foundation as shown. The illustration shows the N. Y., O. & W. standard turntable pit. The center of the pit is of a 1-3-5 mixture of stone concrete and the balance of the pit is of cinder concrete mixed with the same proportions. The concrete is not plastered on the outside but is left as it comes from the forms. During the last summer the New York, Ontario & Western has put in four of these turntables, equipped as shown in the accompanying illustrations.



Showing Air Motor Connected to Turntable—N. Y., O. & W.

Automatic Block Signal Rules of the Missouri Pacific.

DEFINITIONS.

[These, numbered 701-706, are taken from the American Railway Association code.]

DESCRIPTION.

707.—Automatic block signals are those controlled by track circuits and control the use of the blocks, but unless otherwise provided, do not affect the movements of trains under the time-table or train rules, nor dispense with the use or observance of other signals whenever and wherever they may be required.

708.—HOME SIGNALS.

(a) Arm horizontal—Indicated at night by a red light—STOP.

(b) Arm inclined—Indicated at night by a green light—PROCEED.

709.—DISTANT SIGNALS.

(a) Arm horizontal—Indicated at night by a yellow light—CAUTION. Prepare to stop before reaching the home signal.

(b) Arm inclined—Indicated at night by a green light—PROCEED.

710.—(a) All automatic block signals will be numbered with even numbers governing eastbound movements; those with odd numbers, governing westbound movements.

(b) Except where view is unobstructed, the approach to a home signal controlling movements through a block containing a passing track, is governed by a distant signal.

(c) Home signals controlling intermediate blocks, are not provided with distant signals.

711.—Block signals may be put to STOP by

1st—A train in the block;

2nd—An open switch in the main track;

3rd—A car outside the clearance point at siding;

4th—A broken rail;

5th—An open drawbridge;

6th—Failure of the apparatus.

712.—(a) All main track switches are

connected with the signals of the block in which they are located and will cause the signals to stand at STOP unless the switch is set for the main track. When a switch is restored to the main track, the signal will return to PROCEED unless there is a train on main track or other obstruction.

(b) On double track both ends of main track crossovers control the automatic block signals in both directions. Unless both ends of such crossovers are set for the main track, the signals in each direction will be held at STOP.

713.—An overlap is an electrically controlled section of track adjoining a block. The extremity of an overlap is indicated by a post upon which are shown the word "block" and the number of the signal controlled by the overlap.

RULES.

714.—All trains must approach signals under full control prepared to stop before entering the block.

715.—If the home signal is at PROCEED before a train enters a block and changes to STOP after train enters the block, it indicates that the block is unoccupied.

716.—ON SINGLE TRACK if the home signal is at STOP before a train enters the block, or is at PROCEED and does not change to STOP when the train enters the block, the train must stop; wait full ten minutes and then proceed under full control until the train passes out of the block.

717.—ON DOUBLE TRACK if the home signal is at STOP before a train enters the block, or is at PROCEED and does not change to STOP when the train enters the block, the train must stop; wait one minute and then proceed under full control until the train passes out of the block.

718.—As soon as the engineman knows that it will be necessary to stop at a signal, he must give the required signal to the flagman as per Rule No. 14 (c) and the train must be protected in accordance with Rule No. 99 (Standard rules).

719.—When necessary to stop by reason of a signal being at STOP, the train should be stopped before reaching the block signal. Should this be impossible, the engineman will back his engine clear of signal. This will give the signal a chance to go to PROCEED should the obstruction be removed before the expiration of the wait required by the rules.

720.—Should a train on single track immediately preceding a passenger train, find it necessary to stop under conditions mentioned above, the flagman should be instructed to notify the following passenger train that the train ahead is proceeding through the block in compliance with Rule 716. This will permit the passenger train to proceed cautiously, looking out for the train ahead or other obstruction, without causing further delay.

721.—On single track, trains which have made an unusual stop of a length to exceed two minutes within the limits of a block, must not exceed a speed of ten miles an hour until the next automatic block signal is reached.

722.—A train which is to take siding at a meeting point within the limits of a block, may pass the home signal at the entrance thereto if at STOP and proceed under full control to the siding. In case trains cannot pull in past the clearance point by reason of their length, a flagman should at once be sent to notify the expected train, thus enabling it to proceed to the meeting point without the prescribed wait of ten minutes.

723.—In taking siding at meeting and passing points, trains should pull in past the clearance point before stopping, otherwise the signals at both ends of that block will be held at STOP, causing unnecessary delay to approaching trains.

724.—Where a train which is to hold main track at a meeting point arrives before the train which is to take siding, the train on main track must not pass overlap post on engineman's side, nor must trainmen change switch entering siding, until train which takes siding arrives at entrance to block.

725.—On single track when following trains or sections are entering the portion of road controlled by block signals, each train or section will allow the preceding train or section, five minutes to clear the block. If the block is not clear at the expiration of five minutes, the train will proceed under full control, expecting to find the block occupied by the preceding train. Trains passing from a block to the portion of the road not controlled by block signals, will be governed by Rule No. 91 (Standard rules).

726.—Trainmen are reminded that although the distant signal indicates the position of the home signal, the home signal may assume the STOP position after the distant signal has given the PROCEED indication, and while the train is between the home and distant signal. For this reason trainmen must be on the alert, prepared to bring the train to a stop if the home signal indicates STOP and be governed by Rules 716 or 717.

727.—A train passing an automatic distant signal at CAUTION must be prepared to stop before reaching the home signal.

728.—In order to avoid setting main track signals at STOP, cars or engines must not be allowed to stand on side tracks between the fouling blocks and switches.

729.—All work trains are required to clear main track ten minutes before passenger trains are due at the block limit in either direction.

730.—Conductors and enginemen must report to the Superintendent on blanks provided for the purpose from the first open telegraph station, the number of any signal not working properly. The signals must be observed by the enginemen when the train enters and by the trainmen when the rear of the train passes out of the block. This information must be sent by operators on the train wire to the train despatcher.

731.—Enginemen must not allow either fire-box or front-end cinders to be dropped on the tracks that are governed by automatic block signals.

732.—Automatic block signals do not in any way affect the rights of trains nor the general rules, and do not relieve trainmen and others from any responsibility under the rules. The block signals are an extra precaution and must be strictly observed.

733.—Rule 99 will be as strictly enforced within the block territory as without.

Railroad Shop Tools.

(Continued.)

SHAPING MACHINES.

The accompanying illustration, Fig. 1, shows a 24-in. back geared crank shaper made by the American Tool Works Company, Cincinnati, Ohio. The column is strongly braced internally and the ram bearing projects both in the front and the rear of the column. The base is of the extension type, fitted with a pad to receive the table support. The ram has long, wide bearings, and has gibbs for taking up the wear. The stroke of the ram is positive and has eight rates of speed, ranging from nine to 107, and the length of the stroke can be changed by means of a hand wheel while the machine is in motion. A pointer on the ram, traveling along an index, shows the length of the stroke the machine is set for. The length of the stroke is adjusted by the handle on top of the ram. The rocker arm is placed near the base-line and gives the ram an almost uniform rate of speed its entire stroke and provides a quick return. The machine is readily changed from single to back geared by moving a lever within easy reach of the operator. The back gear motion is 24.3 to 1, and this gives to the machine great power in taking heavy cuts. The head swivels to 50 deg. and is provided with a locking device. It is also

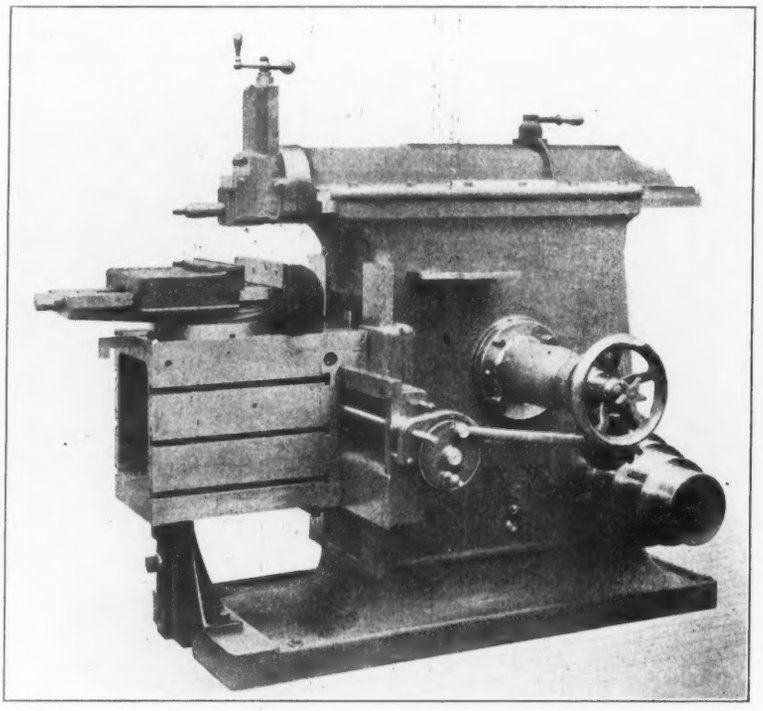


Fig. 1—The American 24-in. Shaper.

fitted with a micrometer down feed adjustment, graduated in thousandths of an inch. The tool post is large and can be used for tool holders with inserted cutters. The table is of box form, with T slots cut in both its top and sides, and is detachable from the apron. The cross rail is also of box form and is secured to the column by gibbs. The elevating screw is provided with ball bearings and the elevating gears are cut from solid steel. An automatic variable cross feed is provided, ranging from .013 in. to .31 in. Shafts up to 3¼ in. in diameter can be passed under the ram for keyseating. The vise swivels and is provided with a graduated base. The jaws are fixed and extend down to the surface of the table. The pulleys on the center shaft are 12 in. in diameter by 4¼ in. face, and should run at 210 r.p.m. This machine can also be furnished with a direct connected motor drive, in which case the motor is mounted on a solid base cast integral with the shaper base. Connection to the driving shaft is made through spur gearings, and the controller is placed at the top of the column and within easy reach of the operator. A number of these machines have been placed in railroad shops, where they have given satisfaction.

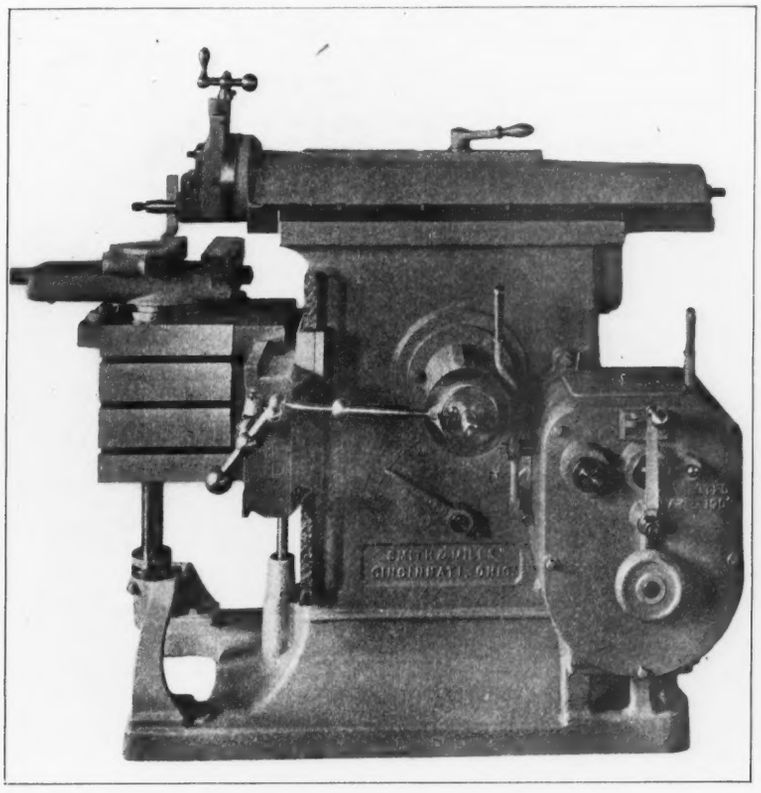


Fig. 2—Smith & Mills Shaper.

Fig. 2 shows a crank shaper made by Smith & Mills, Cincinnati, Ohio. The column of this machine has projections both in front and back for the ram slides, and is well braced internally. The ram, cross rail and table are also well braced and ribbed, and the base is provided with projections for attaching a table support, when necessary. The crank pin is adjustable and allows the changing of the length of stroke while the machine is in motion. A locking device clamps the crank pin, thus obviating the possibility of the stroke to vary while the machine is doing its work. The crank lever is adjustable for wear of the sliding block, and also for the cutter bar connection. An index is provided for recording the length of the stroke made by the cutter bar. An outside bracket is fitted to the column for supporting the end of the driving shaft. The adjustable feeding device in connection with the automatic cross feed is variable, and can be changed while the machine is in motion. The box table has T slots on both of its sides as well as on its top. The table can be removed and work can be bolted to the slotted apron when desired. The vertical feed and cross feed screws are fitted with micrometer attachments. Provision is also made for passing a shaft through the column for keyseating. The vise is fitted with a graduated base and steel faced jaws. It can be used on either the top or sides of the table and can be arranged so that the jaws will project past the sides of the table. It can be swiveled to any angle and is held in place by a clamping screw These machines are made in three sizes, having the following dimensions:

	Dimensions.		
	No. 5.	No. 6.	No. 7.
Length of stroke	16½	20½	24½
Cross motion of table	20	22	26
Vertical adjustment	17	16	16
Feed of tool block	6	7	8
Ram bearing in column	26	30	34
Diam. countershaft pulleys.	10x3	12x3½	12x3½
Speed of countershaft	200	200	200
Opening in vise	8	9	10
Admitt'g shaft for key-seat'g	3	3½	4

The machine as shown is fitted with a speed box; this rests on the base and is fastened to the side of the column, as shown. The main features of the device consist of a cone of gears; a driving pinion and a revolving carrier, having arms to which are attached idle pinions. These couple alternately the driving pinion, and one of the gears on the cone shaft. The cone shaft engages the bull wheel, which operates the crank, and gives motion to the tool head.

By reference to the line drawing, Fig. 3; A represents the cone of gears; B the carrier on which are the intermediate pinions C C C, etc.; the carrier is rotated by a pinion D, which is operated by a crank, so as to bring any one of the pinions into position, between the cone and the main pinion E. The main shaft runs through the box and column, with a bearing on the rear side; beyond this are the tight and loose driving pulleys. One revolution of the crank in either direction changes the position of the carrier from one arm to another, and thus changes the speed. The lever extending upward, through the slot in the box, is to engage or disengage the back gears. The lever between the box and the center shaft in the column is for starting or stopping the machine. There are eight specific changes and 64 variations of stroke. An index plate shows the proper speed for various lengths of stroke, and a dial plate shows the speed that is in gear at the time.

(To be continued.)

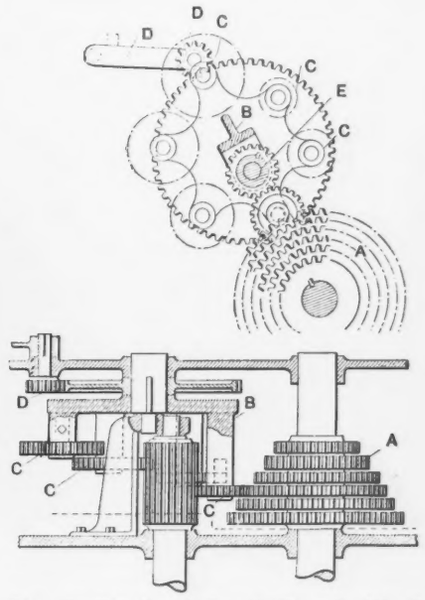


Fig. 3—Details of Speed Box—Smith & Mills Shaper.

B. & O. Relief Department.

The Baltimore & Ohio has published a review of the doings of its relief department since May 1, 1880, when it was established; and the principal features of the establishment are described. The association was granted a charter in 1882. For the "Relief Feature" the company gave at the outset $100,000, and it now pays $6,000 yearly for relief and $10,000 for physical examination of applicants. The company holds the funds and pays interest on them at 4 per cent. Like the other roads which have such departments, it furnishes office room and furniture and bears most or all the expense of operation. If there is a deficit in any year in the Relief feature the company makes it good, but if there is a surplus it is added to the association's reserve fund.

On the Baltimore & Ohio pensions are paid only to members of the Relief department. The benefits paid by the "Relief Feature" from May, 1880, to June 30, 1904, were as follows:

Deaths:	No. of pay ments.	Cost.	Average per payment.
Accident; on duty...	1,994	$2,126,241	$1,066.32
Other causes	4,023	2,054,711	510.74
Disablements*	131,311	1,618,319	12.32
Surgical expenses	90,871	261,612	2.88
Disablements.†	162,666	2,460,926	15.13
Aggregate	390,865	$8,521,810	$21.80

*From injuries received in discharge of duty.
†From sickness and causes other than above.

Members and their families travel over B. & O. lines at half fare, and their children,

when they go to school on the trains of the company, are carried free. The membership of the Relief Feature is 46,198, of whom 2,136 are out of the service but retain their life insurance. The Savings Feature is the same as a savings bank for the men, and for several years it has paid extra dividends of 1½ per cent., making the total interest received by depositors 5½ per cent. At any station where there are two or more employees who wish to deposit, a depositary will be appointed. The deposits June 30 last amounted to $604,015. This department loans money to employees on real estate security at 6 per cent. The amount of money lent during the last fiscal year was $498,074, and the total amount of loans outstanding was $1,389,026.

Employees are eligible to pensions when they have been 10 years in the service of the company, four years a member of the Relief department and have reached the age of 65. The fund for the payment of pensions is derived wholly from the contributions of the company, which gives $75,000 a year. Where an employee has been a member of the Relief Association for 15 years his pension is larger, and for each additional five years there is another increase. Since the beginning, Oct. 1, 1884, 830 persons have been pensioned, of whom 354 are still on the list.

The question of the company's liability for an accident does not enter into the right of a member to receive benefits. He is paid his benefits whether there is any liability on the part of the company or not. Even though he may be himself responsible for the accident which caused his injury and caused the company loss thereby, through the destruction of property or otherwise, he receives his benefits regularly and is given surgical and hospital attention free of charge.

"The establishment of the Relief department, it is believed, has done a great deal toward solving the labor problem for the Baltimore & Ohio. Through the Insurance Feature, the pride the employee takes in the home he may be purchasing, or the desire to retain and add to the little store he has laid by for a rainy day, and the practical certainty that he will be taken care of during his old age, the company has attached the men to its service to such a degree that they hesitate about leaving, and are inclined to turn a deaf ear to the agitator when strikes are talked of."

Railroad Provident Institutions.*

Mr. Riebenack devoted the first part of his address to a general review of his subject, taking in the whole country, and the latter part to a more detailed account of the several departments of the Pennsylvania which are included under this head. His data all refer to the year 1903. He finds 24 railroads which are interested in insurance or relief of some kind for their employees, including regular life and accident insurance, hospital service and libraries, besides the more generally known relief and pension departments. Nine roads have relief departments. These lines aggregate 31,000 miles and employ 318,000 men, equal to one-fourth of the railroad employees of the country. The relief membership is 206,000; average annual disbursements $2,230,000. The first railroad pension fund in the United States was that of the Baltimore & Ohio, started in 1884. On July 1, 1900, that road increased its annual appropriation for pensions from about $31,000 to about $81,000, so that now there is a regular scale of allowances. Sixteen roads have pension funds in operation, two others will soon establish such, and several others, including the Vanderbilt lines, are preparing schemes. The roads reporting pension funds in operation operate 50,000 miles and have 500,000 employees; annual appropriations, $1,350,000; number of pensioners on the rolls, 3,200. These railroad pension funds are supported by the railroad companies concerned, the beneficiaries making no contribution whatever thereto. Savings funds are only found with three companies; the Baltimore & Ohio, the Pennsylvania Lines East and the Pennsylvania Lines West. In the Baltimore & Ohio Saving Fund the wife, mother, or child of an employee, or the beneficiary of a deceased member of the relief fund, may deposit under the same terms and conditions as employees, and the fund, which was established in August, 1882, also has an important adjunct known as the "Loan Feature," which enables employees members of the relief fund to borrow money at a reasonable rate of interest and on easy terms of repayment for the purpose of acquiring and improving homesteads. The combined total of depositors for the three roads Dec. 31, 1903, was 14,807, and depositaries 1,895; deposits and withdrawals since organization having aggregated respectively, $14,877,724 and $10,047,776.

Hospital service was one of the earliest forms of relief adopted by the railroads on behalf of their employees, the first hospital department, as conducted at the present time, having been organized in conjunction with the Southern Pacific Railway, in California, in 1868. The average monthly contributions by members are 25 and 50 cents, while the railroad companies usually furnish the hospital buildings and other quarters, also free transportation to and from the same, and not infrequently assume responsibility for financial deficiencies. Many roads, particularly in densely populated sections, rely upon state, municipal and private hospital service, and to that end have agreements with such institutions for the treatment of their sick and injured employees on reasonable terms. There is also in vogue provision for extending first-aid to injured persons, consisting of the "first aid packet" and the "emergency box"; while the hospital car and the furnishing of baggage, wrecking, and maintenance-of-way cars with stretchers are finding general adoption. A list compiled from data supplied by 35 railroads with distinctive hospital organizations, represents an aggregate of about 70,000 miles of roadway, and employees numbering upwards of 360,000, the number of cases treated annually approximating 275,000.

Libraries.—Upwards of 50 roads, representing over 100,000 miles of roadway and nearly 800,000 employees, were on record Dec. 31, 1903, as being interested in libraries and reading rooms for their employees. These features are largely associated with the Young Men's Christian Association, and embrace about 250,000 volumes.

Two notable instances of libraries conducted exclusively by railroads are the Baltimore & Ohio Circulating Library, with 15,000 volumes, and the Pennsylvania Mechanics' Library, at Altoona, Pa., with 35,000 volumes.

Young Men's Christian Association.—The Y. M. C. A. first found lodgment in America at Montreal, Nov. 25, 1851, and in the United States at Boston on December 29 of the same year. The railroad department of the association has its principal and almost exclusive standing in the United States, the work having started on the Cleveland, Cincinnati, Columbus & Indianapolis at Cleveland, in the fall of 1872.

On Dec. 31, 1903, roads representing 79 per cent. of the total railroad mileage of the country recognized and supported the association. On 40 roads there is direct and active operation and promotion of railroad branches, comprehending, in round numbers, upwards of 100,000 miles of roadway and 785,000 employees, 55,000 of whom were identified with the branches, the combined annual operative cost of which approximated $500,000. The railroads covered by these figures are regular contributors to the movement. Many others, while not directly identified with the work, are systematic subscribers thereto. Membership rates are nominal, ranging from $3 to $5 a year, for the privileges extended. The bulk of expenditure is, however, borne by the railroads concerned.

Educational courses, conducted for the most part throughout the fall and winter months, and which are evidencing pronounced increase in the variety and usefulness of the studies comprehended, are growing in popularity and value. These courses embrace in their curriculum those commercial and railroad branches a knowledge of which is of prime importance to ambitious and progressive employees, and particularly to those who would otherwise be debarred from enjoying that encouragement and opportunity for general intellectual training and improvement which experience has shown to be essential for individual advancement in any chosen vocation. Tuition rates are nominal, the classes being in charge of specialists of well-known ability and highest endorsement.

It is to be noted that one of the prominent features in the success of the movement rests on the fact that it is free from sectarian complications, the religious work being of such a broad general character that it can be participated in without intrenching upon denominational affiliations—being based upon the simple principles of morality that are accepted and recognized by all Christian people.

Stock Sharing.—Co-operative stock sharing plans are in operation with the Illinois Central and the Great Northern, representing an aggregate of 9,900 miles of roadway and 64,010 employees. Illinois Central employees may purchase the company's capital stock upon an easy payment basis, receiving a fixed rate of interest during the time payments are being made for the shares. An employee may subscribe for one share at a time, payable in instalments of $5 or any multiple thereof; on the completion of payments the company delivers to him a certificate of the share registered in his name on its books; he can then begin the purchase of another share on the same plan. The rate of interest allowance is 4 per cent. Any officer or employee making payments under the plan, and for any reason desiring to discontinue them, can have his money returned, with accrued interest.

Under the Great Northern plan a certain number of shares of stock was originally issued to be handled by a specially created Employees' Investment Association. Certificates are issued against these shares, in multiples of $10. The company guarantees 6 per cent. interest on certificates taken out between dividend dates, from the dates of such certificates to the next following dividend date (interest being paid in the form of quarterly dividends); and also guarantees the same rate of interest on certificates redeemed from the last dividend date to the date of such redemption. Between dividend dates the company guarantees that the holder of a certificate shall receive the same percentage as the company pays in dividends on its stock. At the present time there is outstanding about $710,000 worth of these investment

*Abstract of an address by Mr. M. Riebenack, Assistant Comptroller of the Pennsylvania Railroad, before the National Civic Federation, at New York, November 15.

certificates, and the amount is gradually increasing.

Miscellaneous.—The speaker then referred briefly to the Andrew Carnegie relief fund, established in 1902, with an endowment of four millions, for the employees of the Carnegie works, mines, railroads and shops; the Moses Taylor Hospital at Scranton, Pa., conducted principally in the interest of the employees of the Delaware, Lackawanna & Western Railroad, and the Lackawanna Iron & Steel Company; and the home for orphan girls in Philadelphia established by J. Edgar Thomson. The six principal express companies are interested in insurance and pension measures, Young Men's Christian Associations and libraries and reading rooms, on behalf of their employees. One—Wells-Fargo—has libraries located in five of the principal cities of the United States and in the City of Mexico, carrying a total of 15,523 volumes, and 22 smaller libraries.

The Pullman Company, operating over 175,761 miles and with 20,398 employees, encourages its employees to carry good insurance, and has under consideration a pension plan in their behalf. This company conducts a "merit system" for its transportation men, under the operation of which employees with over five years' service to their credit are rewarded by having placed conspicuously upon their service uniforms "meritorious marks" indicative of their years of service. This feature is highly appreciated by the traveling public, the presence of these marks of special distinction inspiring confidence and security, by reason of evidencing long and faithful discharge of assigned duties.

That part of Mr. Riebenack's address concerning the Pennsylvania Railroad embraces a subject with which our readers are already familiar. For the 18 years ending Dec. 31, 1903, the receipts and expenditures of the Pennsylvania's Relief department aggregated as follows, cents omitted:

Receipts.	
Contributed by members	$11,672,717
From company	2,544,348
From other sources	422,027
Total	$14,639,092
Disbursements.	
Superannuation allowances	$148,662
Operating expenses	1,815,641
For sickness	4,455,618
For accident	2,246,454
Death from natural causes	3,527,818
Death from accident	1,323,616
Total	$13,517,811

During these 18 years benefits were paid for 469,000 cases of disablement, for periods ranging from one day to 17 years, while 8,531 families of deceased members received death benefits varying in amount, from $250 to $2,500, according to class membership. The membership Dec. 31, 1886, was 19,952, while at the close of 1903 it numbered 76,507, or about 69 per cent. of the total number of employees, and included nearly all those who were eligible to membership. Members may draw for disablement in 52 weeks as much as their contributions would aggregate in about 16 years, and the death benefit is equal to the contributions of 28 years.

The superannuation fund, established five years ago, is a department of the Relief Department, having no connection with the pension fund, which is supported wholly by the railroad company. The superannuation fund provides, so far as the surplus of the department will allow, for allowances, equivalent to pensions, for members retiring from active service. This appears to be regardless of age, whereas 65 is the lowest age at which an employee can become entitled to a pension. Superannuation payments are intended to give a retired employee an equitable share of the surplus which his payments have contributed to. As the surplus has not been sufficient to pay all of the superannuation allowances that the service demanded, the railroad company has bound itself to pay any deficiencies up to 1907.

The Pennsylvania Railroad pension fund has now been running five years. For the four years up to 1904 the pensions paid amounted to $1,224,088; expense of operation $20,135. Total persons pensioned, 2,126, of whom 527 had died. Of the total retired 456 were under 70 years; and of these, 348 were relieved at their own request.

The Pennsylvania Railroad savings fund was established in 1888. The company is the custodian of the money and the present rate of interest is 3½ per cent. Depositors, 9,494; deposits in 1903, $1,260,230; withdrawals, $796,204; balance on deposit, $4,010,117; average deposit, $420.

The Pennsylvania has no hospitals as it makes satisfactory arrangements with public and private hospitals already established. "First aid emergency boxes" have now been provided throughout the company's lines.

The Pennsylvania has supported the Young Men's Christian Association since 1886, the West Philadelphia branch having been organized in that year, after ten years' agitation. This association is the largest railroad branch in the world, having a membership of about 2,500 and a building and establishment costing $140,000. On all of the lines both east and west of Pittsburg there are 31 "branches" with 12,732 members. The majority of these associations are in buildings belonging to the railroad company.

The total expenditures of the Pennsylvania for its employees in the year 1903 amounted to $943,618, as follows, cents omitted.

	Lines east.	Lines west.
Relief	$262,777	$91,614
Pension	363,629	130,381
Hospital	18,370	2,197
Saving Fund	8,417	4,537
Y. M. C. A. and libraries and reading rooms.	53,351	8,341
Total	$706,545	$237,072

In his conclusion Mr. Riebenack says: Relief funds may be properly styled "mutual benefit associations," as under their operations each member practically contributes for the joint welfare of himself and fellow members, and with company co-operation the duration of mutual assistance is unlimited. Membership is purely voluntary. As a matter of fact "compulsory" membership is prohibited by the United States Arbitration Act of June 1, 1898. It is sometimes held that membership is nominally voluntary but practically compulsory. This view undoubtedly arises from the circumstance that the companies, in accordance with the principle observed by all large business undertakings requiring the constant employment of large numbers of men, exercise the generally conceded right to decide upon the physical fitness and general qualifications of applicants for positions in their service. In carrying out this principle the discriminations made between applicants may appear to the uninformed to indicate a disposition to enforce "compulsory" membership, but this is an entirely erroneous conclusion, as such a course is of paramount importance with railroads for safeguarding the interests of the public as well as their own.

The question of joining the fund is laid before new employees without the slightest pressure one way or another, and there are no cases on record to my knowledge where an employee has been dismissed from service simply because he refused to become a member of the relief fund, or rejected for employment on account of his declining, if employed, to become a member of the organization. It is entirely optional with the employee after he has become a member of the relief fund to resign from it at any time he may see fit, and his status with the company as an employee is not affected by such action on his part.

The stability of relief departments is based altogether on the extent to which the railroad companies assume responsibility for their operations and are willing to guarantee their financial obligations. . . . No provision is made for the return to members of the relief fund, leaving either the service or the fund, of any proportion of their contributions, for the reason that during their connection with the fund they have been protected against sickness and accident at a minimum cost, and to make repayments would necessitate an increase in rates, which would mean an added expense to all the members. It is also a fact that the laws of some states prohibit the continuance of fund death benefits after employees leave the service of the corporation, as being an infringement upon state insurance statutory enactments.

An important point in connection with the operation of relief funds is the question of a member's right to have recourse to action at law against the interested railroad companies in lieu of accepting accident benefits extended by the funds. To understand this point it must be borne in mind, primarily, that the applicant for fund membership enters into an agreement with the fund to accept, in the event of sustaining disablement injury while in the service and in the performance of service duties, the accident benefits specifically prescribed in fund regulations. This is a distinct agreement, with a good and valid consideration, made between proper contracting parties, and, therefore, invested with due legal status. By becoming voluntarily a party to the agreement the applicant should live up to its terms, any overt or serious violation of which should, and does, result in relinquishment by the violating party of the benefits that would otherwise have accrued to him thereunder. The companies by reason of guaranteeing that all obligations of the funds will be met, also paying their deficiencies, and contributing the entire amount necessary in the conduct of their operations, clearly assume responsibilities which warrant them in asking employee applicants to enter into the agreement referred to.

The provision by railroad companies of these organizations for the benefit of sick, injured, and aged employees, and designated beneficiaries in the event of their death, in conjunction with the various opportunities for mental, physical, and spiritual betterment, are actuated by truly humane and benevolent purposes and in their continuous development are bringing about a reciprocal feeling of mutual regard and respect between capital and labor. Conditions are being improved and at the same time energy is being vitalized and ambition stimulated among the rank and file of railroad employees.

Some Siberian Railway News.

[Culled from the *Irkutsk Daily Sunovitch.*]

The war has had one noticeable effect upon the local freight service. Goods and Nihilists, that in time of peace were rushed through from Russia in 19 days and some hours, now never get here at all. This state of affairs has led inevitably to renewed talk of the trolley line between Irkutsk and the Baltic. A public meeting to discuss the matter will be held to-morrow evening at Cooperoff's Union.

Alexieff Plodovski, trackwalker on the Lamsdorf Park section of the Trans-Siberian system, has been highly commended at head-

quarters for his presence of mind. While tramping his post recently, Plodovski perceived some heavy timbers on the track ahead of him. Realizing the necessity for prompt action, he consulted his pocket-calendar, with one of which every track walker is provided and saw with a start that it was Tuesday, the 21st.

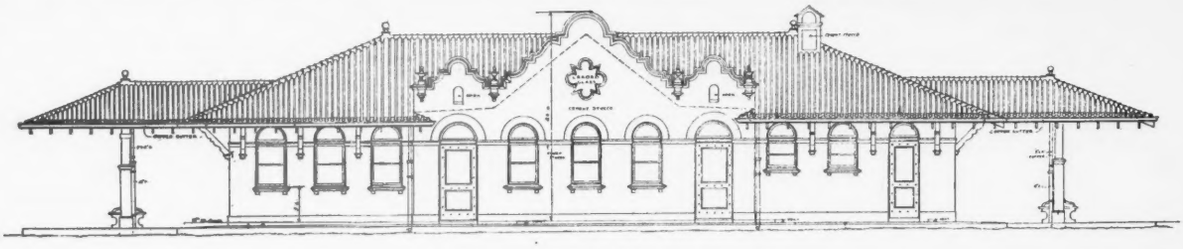
"Ivan, the Terrible!" he ejaculated, and his heart for a moment stopped beating, "what is to be done? The Morning Calm Flyer is due here in two days. There is not 12 hours to be lost!"

Making his way to Lamsdorf Park, he returned next day with the station porter, Petroff Jackson, and a crowbar. Fifteen minutes' vigorous effort, time out for lunch, was sufficient to clear the way of all obstructions, but not a jot too soon, for the next evening at 8 o'clock, with a terrifying rush and roar, the Limited dashed by, its passengers blissfully ignorant of the danger so narrowly averted.—*Puck.*

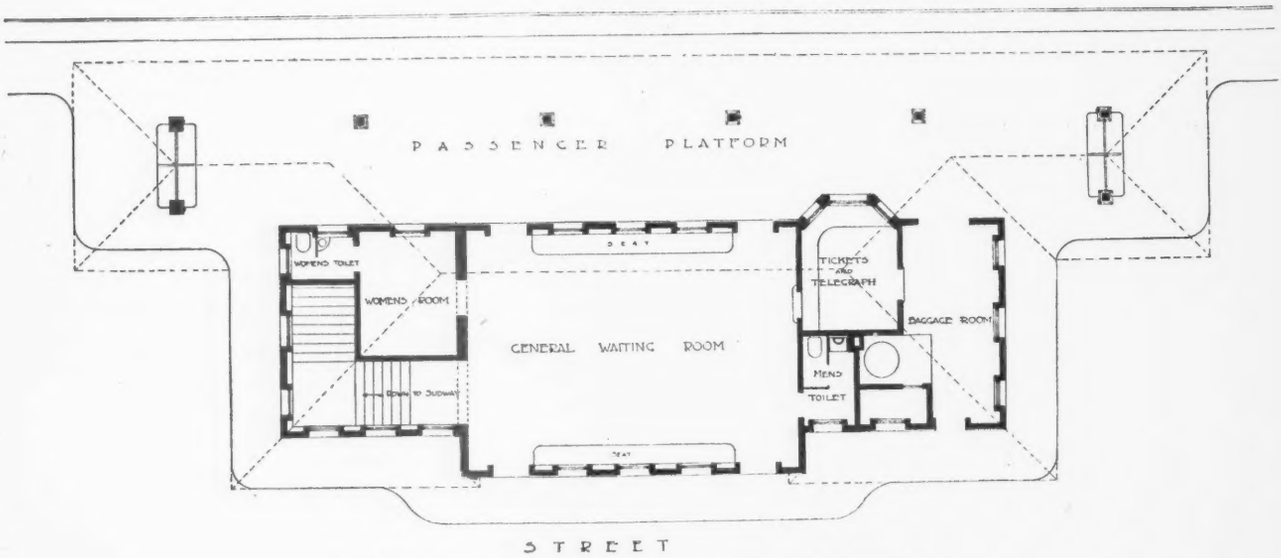
Small Railroad Stations.

The designing of railroad station buildings affords the architect almost unlimited possibilities for artistic and harmonious studies and yet few have entered seriously into this broad field and been successful. Mr. Bradford L. Gilbert is perhaps the best known architect in this particular line in this country, and the numerous examples of his creative ability throughout the United States attest to his artistic skill. In 1895 the *Railroad Gazette* published a portfolio of railroad station designs by Mr. Gilbert containing numerous examples of his work, and in response to a widespread demand for additional designs of more recent date Mr. Gilbert has selected a number of his latest sketches and drawings of stations and has embodied them in a supplementary portfolio which is now bound with the original plates. The accompanying illustrations of two small suburban stations on the Central Railroad of New Jersey which were designed by him are reproduced from the large plates in the portfolio. The station at Lebanon is built of local stone and cement with wood finish in the Old English style with tile roof and cement platforms extending all around the building. Inside it is finished in natural wood. Such a station is inexpensive but ornamental and convenient. The other illustration shows a floor plan and street elevation of one-half of a twin station connected with a subway under the tracks at Roselle, N. J. It is built of concrete throughout in the Old Mission style and was completed in 1902.

Small Station at Lebanon, N. J., Central Railroad of New Jersey.



Street Elevation.



Floor Plan and Street Elevation of Train Station at Roselle, N. J.

A "prison car guide" began to appear in Prussia last October. It seems that other passengers had found it disagreeable to ride with hand-cuffed jail-birds and armed officers on their way from place of trial to penitentiary; so some fourth class cars have been fitted up with grated windows, etc., and run twice a week over lines connecting places where criminal courts sit and those provided with penitentiaries, giving the condemned gentlemen and their attendants the exclusive use of a private car, which no one begrudges them.

GENERAL NEWS SECTION

THE SCRAP HEAP.

The Delaware & Hudson has added a new branch to its industrial department and put in charge of it Prof. H. H. Hindshaw, formerly state geologist. Prof. Hindshaw will devote his time to the mineral resources of the territory along the company's lines.

The Hocking Valley and the Ohio Central have contracted with the Bell Telephone Company for the establishment of an extensive long distance telephone system at Columbus, Ohio, with connections to Toledo and other points; about 45 stations in all.

The Southern Railway has put the manual block system in use on its line between Ooltewah and Chattanooga, 15 miles. There are five intermediate block stations. The same company is extending the use of the block system on its main line between Washington and Atlanta. A press despatch says that the Oregon Railroad & Navigation Company has decided to introduce the block system between La Grande and Gibbon, about 100 miles.

The United States Circuit Court for the Western District of Pennsylvania, on Jan. 3, 1905, entered an order dismissing the bill of complaint in the suit brought by James Pincin, of Altoona, Pa., against the American Locomotive Co., the Pittsburg Locomotive Works, and H. B. Ayers, General Superintendent, and awarded costs to the defendants. This suit was brought on the Pincin patent, No. 719,133, dated Jan. 27, 1903, which related to an eccentric having a two part wear ring secured to it by bolts and a two part bushing in the eccentric strap, and which was alleged to be infringed by H 6 A engines built for the Pennsylvania Lines by the Pittsburg Works of the American Locomotive Co.

Bids for Dry Dock at New York Navy Yard.

Bids were opened at Washington, December 31 for the New York Navy Yard dry dock, for which $1,000,000 has been appropriated. George B. Spearin, of New York, submitted the lowest bid, $773,292, the work to be completed in thirty months, and will probably get the contract. The other bids were: John Pierce, of New York, $885,000; United Engine & Construction Company, of New York, $815,934; Buckley Realty Construction Company, of New York, $896,400; New York Jewell Filtration Company, $829,880.

Exports in 1904.

For the 11 months ending November 30, the Department of Commerce and Labor gives the value of manufactures exported as $459,575,023, of which $46,608,896 was for the month of November. The value of iron and steel exports for November was $12,831,980, as compared with $7,985,961 in 1903, and for the 11 months ending November 30, was $118,182,998, as compared with $89,682,787 for the same period in 1903 and $90,136,024 in 1902. The rails exported for the first 11 months of this year were 395,799 tons valued at $10,182,402, as compared with 23,134 tons valued at $734,036 in 1903 and 66,854 tons valued at $1,881,180 in 1902.

"Campaign of Education"—A New Kind.

A press despatch says that the Lake Shore & Michigan Southern is conducting a "campaign of education" for the city councils along its line. Wherever there has been any controversy over the speed of trains within city limits, the management is inviting members of the council to take a trip on the company's inspection engine, No. 30, which is fitted up so that passengers may ride outside the cab and obtain a full view of the track. The aldermen have a practical demonstration of reduction of speed and of quick stops and are shown how the company may be handicapped by speed ordinances. As a result of these demonstrations the company expects more amicable relations with local authorities at points along the line.

Output of Baldwin Locomotive Works for 1904.

The total output of the Baldwin Locomotive Works for 1904 was 1,453 locomotives, of which 1,352 were steam, 94 electric and seven compressed air. This is nearly one-third less than the number built in 1903, which was 2,022. The falling off in business which began in the autumn of 1903, affected the locomotive industry. The works were run at their full capacity until last spring, but from June until the latter part of October very few orders were received. During the year, 286 locomotives were exported to the following countries: Argentina, Brazil, Canada, Chile, Columbia, Costa Rica, Cuba, Guatemala, Hawaii, Japan, Korea, Mexico, New Zealand, Peru, Porto Rico and South Africa.

Mr. Hill on Federal Regulation and Trusts.

The following is taken from an interview with Mr. James J. Hill, printed in the New York *World:*

The most offensive word to the American people is "pool—railroad pool." Any administration or Congress that attempts to legalize railroad pools will be quickly turned out by an uprising of the people.

There is a very simple method of dealing with the trust question. Let it be made necessary for any industrial corporation that wishes to do an interstate business to secure a Federal license; but before that license is issued the corporation must prove that its capital is real money and based upon actual value.

Every railroad would be happy to have rebates abolished and the law against them enforced. Why does not the Interstate Commerce Commission prosecute President Ripley of the Atchison if he has been giving rebates? The law never has been enforced, nor any one prosecuted. A pool is a game in which you hand over your property to another man to divide—a device by which a weaker concern seeks to obtain an equality with the stronger.

A railroad pool would help one town and ruin the next. The Canadian Pacific once put on a line of steamers from San Francisco to its terminus at Vancouver and cut the transcontinental rates. The transcontinental pool then in existence paid the Canadian Pacific half a million a year to discontinue business out of San Francisco. Who paid that half million? The shippers, of course. Southern planters are burning their cotton. Japan and the Far East could take 2,000,000 bales of our cotton, but the past year they took only about 200,000 bales. Not long ago we made a through rate for cotton from Galveston to Hongkong and encouraged shipments. The government ordered us to publish our rate—make it known to the world. We declined and discontinued the rate. The cotton is being burned.

Ten years ago there were practically no shipments of lumber from the Pacific coast to the East. We (the Great Northern) cut the rate from 90 cents to 40 cents. It was not long before shingles were legal tender in the State of Washington.

In one year the Northern Securities Company reduced freight rates two million dollars. The government says we must publish our rates, and have them all equalized—even fixed by the government. Competition is the test that proves the survival of the fittest. No government has a right to put a check on one and give a bounty to another.

It is not the magnitude of a business that works damage. Has the enormous business of the Krupp Company injured Germany? Can anyone in this country point out an injury inflicted on the people which can be traced to the magnitude of the Carnegie Company—mind, I say the magnitude. The serious objection to trusts is the method of their creation—not for the manufacturing of any particular commodity, but for the purpose of selling securities which represent nothing more than good will and the prospective profits to the promoters.

Germany is our most active and hardest competitor to-day in the markets of the world. That is because the German Emperor never ceases, day or night, to work and press forward the best business interests of his country. We as a nation have been too ready to look to State and Federal legislation for remedies which are beyond their power to give. The laws of trade are as certain in their operation as the laws of gravitation. You might as well try to set a broken arm by statute as to change a commercial law by legislative enactment.

A Modern Pattern Shop and Its System of Handling Patterns.

The new pattern building of the B. F. Sturtevant Co., Hyde Park, Mass., is divided midway of its length by fire walls enclosing stairs, elevators, etc. One-half the building, with stories respectively 17 and 15 ft., is devoted to the flask and pattern making rooms, while the other half, provided with intermediate floors, making four in all, is utilized for pattern storage.

The flask-shop, measuring about 60 ft. by 80 ft., is equipped with band, cross-cut and splitting saws, boring machines and lathe, all driven by a 10 h.p. Sturtevant motor suspended from the ceiling. The industrial railroad runs directly into this room from the foundry across a distance of about 40 ft. and together with an over-head transfer track reduces to a minimum the cost of handling flasks. The lumber for their manufacture is unloaded from cars directly in front of the building. This room includes the metal pattern makers' department equipped with the necessary machine tools. Adjacent

thereto is the locker, wash and toilet room for the building.

Immediately above is the pattern shop abundantly lighted upon three sides and equipped with a full complement of tools, including one single and two double saw

PATTERN COST CARD. PATTERN NO.

NAME OF PATTERN

ORDERED 190 DRAWING NO

WANTED 190 ORDER NO

MATERIAL | Num. Wanted | Price | Amount

No. | Workman's Name | Hours | Rate

COMPLETED 190

INSPECTED

Total Stock and Labor

Expense

Total Cost

Foreman

Form 462.

NO.

Name	No. of art.	No. Pcs.	Name	No. of Part	No. Pcs.
Main Pattern			Core Boxes		
Sweep					
Mould Board					
Loose Pieces					

Dwg. No.

Form 383.

Pattern No. Order No.

Location Total number Required

Name of Pattern

Date Issued Date Returned

Moulder Weight

Deliver to

Form 407 B.

Cards Used for Keeping a Record of Patterns in the B. F. Sturtevant Co.'s Works.

benches, two band saws, a buzz planer and a double surfacer, five lathes, one of which is a 66 in. x 11½ ft. gap lathe, a drill press, a core box machine, numerous wood trimmers, etc. All the power machines are operated by two 10 h.p. Sturtevant motors, both being required for ordinary work, but one always serving as a possible relay in case of accident.

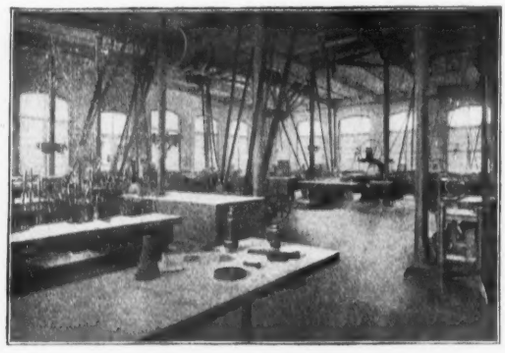
The benches, which accommodate two men each, and measure 2 ft. 6 in. in width by 16 ft. in length, are so arranged along the sides of the building that the men all receive a left-shoulder light. Behind each bench is a working table 4 ft. wide by 16 ft. long. The benches are supported by cast-iron legs of special design, which were built by the Sturtevant Co.; the same design is used throughout the plant. They are equipped with Emmert vises and their tops are of heavy maple plank. A drying chamber for glued work is provided which receives warm air through the general heat flue from a Sturtevant heating apparatus below.

The first floor of the pattern storage end of the building is of concrete and is designed for the keeping of heavy cast-iron patterns. It is served by an industrial railway and turntable, which permits of transfer to the elevator and thence to other floors. Communication between the pattern shop and storage department is direct, while the fire risk is reduced to a minimum by a double system of fire doors. Around the pipe columns which support the floors are clamped the pattern shelving brackets which are adjustable to any height, and shelves on the walls afford storage space for the smaller patterns.

In connection with a description of this shop, the system of handling patterns is of interest. New patterns are numbered consecutively upon the drawings as made. Patterns for gray iron castings take a number without prefix. Patterns for brass castings take a number preceded by O, those for steel have the number preceded by OO, and so on with a different prefix for each material. The numbers are taken out by the draughtsman in a blotter having columns for date, pattern number, name of pattern and drawing number. This record is afterward transcribed into the "Pattern Record" book by the record clerk in the draughting room.

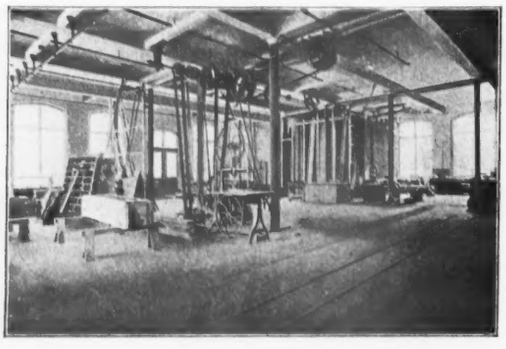
At the time of taking out a new pattern number a "Pattern Cost Card" form 462, is filled out. This is sent with the drawings to the foreman of the pattern shop and is an order for him to make the pattern described. The time is kept in the pattern shop and entered on this card, as is also the record of stock used. When the pattern is completed, it is inspected by the pattern shop foreman who signs cost card and enters date completed. The pattern is then sent at once to the pattern storage, which is under the supervision of the pattern foreman, and the pattern cost card is returned to the drawing room by the next messenger. The pattern cost card is figured by the clerk in the draughting room and filed by pattern number, consecutively. The item "expense" is obtained by keeping a record of the total labor in the pattern shop; and the total material purchased for the pattern shop. When any work other than pattern work is done a record is kept of the time and material, and the pattern shop is given credit. These records give the amount of material and labor chargeable to expense, to which is added a depreciation and fixed charges. The whole is then distributed as a percentage on the hours of pattern labor.

When the patterns are delivered to the pattern storage department proper locations are assigned and records thereof made upon cards (form 383), one for each pattern. These cards are filed in the order of the pattern numbers. Four figures with the addition of a letter are in every case sufficient to locate a pattern. A given location, for instance, may be 2,125B; that is, it is upon the second floor, as shown by the first number "2"; it is in the twelfth row of shelves and the fifth division of that row as shown by the succeeding numbers "12" and "5", and on the B level, the floor level being designated A, and the letters B, C, D, etc., indicating the shelves in their order above.

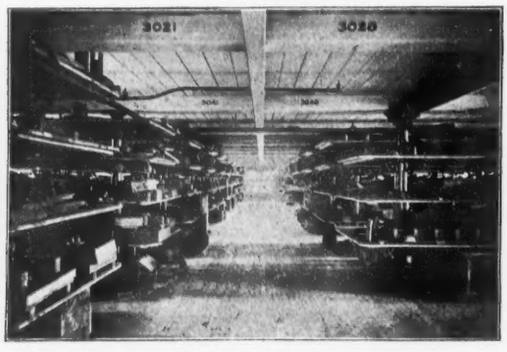


Pattern Shop.

When the foundry foreman receives an order for castings from the office he issues to the pattern storage department a copy of form 407-B properly filled in. The pattern storage keeper on receipt of same refers to index of patterns (form 383) and finds thereon in the upper right-hand corner the location of pattern which he immediately records upon card 407-B. The latter he attaches to the pattern and delivers it to the foundry. A metal clip placed upon form 383 indicates that the pattern is out. When form 407-B is filled in at the foundry office a copy is sent to the clerk of the cleaning room, who daily records on the back the number of good and bad castings made from the pattern and keeps the moulder informed as to the number of castings required to complete the order. When the required number of castings are made, the pattern is returned to the pattern storage, and the metal clip taken off form 383. One copy of form 407-B is destroyed and the other is retained in the foundry office files.



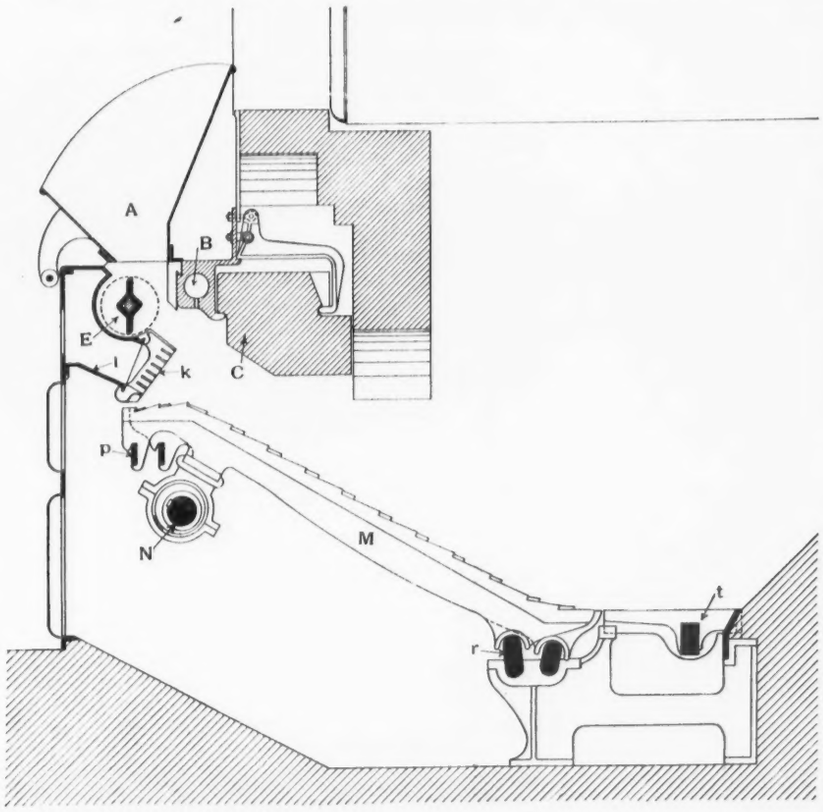
Flask Shop.



Pattern Storage, Third Floor.

A New Mechanical Stoker.

The purpose of a good mechanical stoker is not only to facilitate firing and keep an even and uniform fire on the grate, but also to burn the fuel economically and without the formation of black smoke. Smoke is caused by the imperfect combustion of the hydro-carbon gases which are distilled off from the fuel by the heat in the furnace. In order to burn these gases, and hence prevent smoke, it is necessary to mix them with the required amount of oxygen and subject them to a temperature sufficiently high to produce ignition. With hand firing the greatest amount of smoke occurs when green coal is thrown onto the grate, and even with mechanical stokers considerable smoke may be produced unless provision is made for supplying air to and igniting the volatile gases which come from the fresh coal which is constantly fed into the furnace.



The Ideal Mechanical Stoker.

The accompanying illustration shows the principal features of an improved stoker which is being placed on the market by the Ideal Stoker Company, 114 Liberty street, New York. In this stoker provision is made for burning the volatile gases from the fresh coal before they accumulate to large volume in the furnace. The coal is fed into the furnace from the hopper (A) by means of the agitator (E). The volatile gases which are immediately distilled from the green coal mix with air which enters through the inverted grate k. In order to insure sufficient air for burning the gases, especially when bituminous slag coal is used, an air beam (B) is provided which extends across the entire width of the grate. This beam is open at the ends and has a series of holes in its bottom side through which air is drawn into the furnace directly over the fresh incoming coal. The partition (I) extends across the entire width of the grates and divides the air supply into two parts. The upper air supply serves for the distillation process and is regulated independently from the air used for final combustion which enters through registers in the furnace doors. The small jets of volatile gases and air which leave the green coal come in contact with the fire-brick roof (C) which extends across the furnace at a uniform height from the grate. This fire-brick roof becomes highly heated and hence serves to ignite the gases which strike it. This roof consists of a number of blocks or bricks with parallel joints. Each block is held in position separately as shown in the illustration. It is thus possible to renew or adjust a block without disturbing the other sections and without entering the furnace. The vertical joints between the blocks are filled in with asbestos sheets and when the bricks are lined up, the joints between the blocks are made tight by turning a press screw (not shown) on the outside of the furnace.

The main grate consists of two alternate sets of inclined stepped bars. Each set of bars receives its motion from two eccentrics, one on each side of the furnace. Each eccentric is directly connected to a bar (M), the intermediate grate bars of each set being connected to a cross beam (p) which connects to and extends between the bars (M). The lower ends of the grate bars rest upon free swinging rollers (r), thus allowing for expansion and contraction. The eccentric shaft (N) slowly rotates and imparts to each set of grate bars a combined reciprocating and rotating motion which serves to give a constant downward movement to the coals and break up large pieces of coke. The eccentric straps run on steel roller bearings and the weight of one set of bars while ascending balances the weight of the other set which is descending. The lower horizontal portion of the grate bars is provided in order to prevent loss of coal when dumping the clinkers from the dump grate (t).

Manufacturing and Business.

The Cleveland Pneumatic Tool Company, Cleveland, Ohio, is sending to its railroad friends a handsome 1905 calendar.

Drake & Weirs Company, Cleveland, Ohio, is distributing its 1905 memorandum book. It contains statistics of general interest.

Mrs. Frank P. Smith, wife of Mr. Frank P. Smith, of Manning, Maxwell & Moore, died in New York Dec. 30 and was buried in Columbus, Ohio, Jan. 2.

C. J. Nash, who is now Mechanical Engineer of the Pullman Company, has resigned to accept the position of Superintendent of the Standard Steel Car Company, effective January 1.

The town of Fort William, Ont., has been asked by J. C. Hunter, of Duluth, who controls the Atikokan Iron Range, to assume $200,000 of bonds for a company which is to be organized to establish a blast furnace and steel works there.

The Leader Machine Co., of Jersey City, has been incorporated in New Jersey with a capital of $50,000 to make machinery. The incorporators are: R. D. Huntley, H. Thompson and S. H. Williams, all of Jersey City.

After experimenting for over two years with air-brakes, the Cleveland Electric Railway has given what is claimed to be the largest order for individual air-brake compressors that has been placed in this country. The contract was awarded to the National Electric Co., of Milwaukee, Wis., which has already shipped several carloads of its air-brakes to be fitted to the new convertible type of cars used on the Cleveland Electric Railway.

The United States Steel Piling Co., Chicago, Ill., maker of interlocking steel sheet piling, has been making some experiments at the Homestead works of the Carnegie Steel Company, Pittsburg, Pa., to show positively that it was possible to economically produce the peculiar section of its piling in a rolling mill. The first pieces were successfully made on December 23 and the company is now in a position to offer immediate delivery in any amount.

The Independent Railroad Supply Company, Chicago, announces that it has received an order for 25 miles of Wolhaupter rail joints for 85 lb. A. S. C. E. rail, from the Chicago, Burlington & Quincy Railroad, and that it has also received an order from the Great Northern for Wolhaupter rail joints for equipping 250 miles of track. The above company also states that a medal and diploma has been awarded to Benjamin Wolhaupter, its manager, as collaborator, with the exhibit of the Independent Railroad Supply Co., of rail joints and tie-plates, by the Universal Exposition, St. Louis.

The Coughlin-Sanford Switch Company, New York, announces it has just shipped to the Louisville & Nashville, the Chicago & Eastern Illinois, and the Atchison, Topeka & Santa Fe, car-load lots of swing rail frogs, and that its Western Manager, Mr. Percy Jones, of Chicago, is sending out men to assist in the installation of these frogs. The same company states that it is also filling orders for the Chesapeake & Ohio, the Bessemer & Lake Erie, and the Cincinnati, Hamilton & Dayton, and that it now has frogs installed on some 18 western roads.

The Falls Hollow Staybolt Co., Cuyahoga Falls, Ohio, reports that it has received an order from the Baldwin Locomotive Works for several thousand feet of double refined charcoal iron hollow bars, to be used in staying the fire-boxes of locomotives that are being made for an important Brazilian railroad. The company also says that its for-

eign trade has greatly increased and that its orders for the United States, Canada and Mexico for 1904 were double those of 1903. The company has made a number of important improvements at its plant, practically doubling its capacity.

The Allis-Chalmers Company has opened its new sales offices in Philadelphia in the Land Title Building. The offices heretofore maintained by the electrical department of the company, The Bullock Electric Manufacturing Company, which were in the North American building, have also been removed to the Land Title building, where they have been consolidated with those of the parent company. The new offices are under the charge of Mr. W. A. Wood, who will look after the interests of the power department, the electrical department, pumping engine department, hydraulic department, saw mill machinery department, flour mill machinery department, and the departments which produce rock crushing machinery, cement making machinery, wood preserving machines and plants, mine hoists and machinery of all other kinds for mining and recovering gold, silver, copper and other metals.

Iron and Steel.

The Fort Pitt Bridge Co., which has been given a contract for 9,000 tons of structural steel for the Boston Elevated Railway extension, will sub-let the contract to the Lackawanna Steel Co.

The Midvale Steel Co., it is reported, will put in competitive bids to the Navy Department January 12, as well as the Bethlehem Steel Co. and the Carnegie Steel Co., for armor plate contract.

The Vanderbilt Lines, it is reported, have given orders for 125,000 tons of rails for delivery this year, of which 40,000 tons will be furnished by the Illinois Steel Co. The remaining 85 tons will be divided between the Lackawanna Steel Co., the Carnegie Steel Co., and one or two others. The Chicago, Burlington & Quincy, Northern Pacific, Illinois Central, Chicago, St. Paul, Minneapolis & Omaha, Wisconsin Central, Chicago Great Western and the Chicago North Western, are also reported as giving orders for rails aggregating 270,000 tons. In addition to the contract for 65,000 tons standard open hearth rails given by the Southern Railway to the Tennessee Coal & Iron Co., contracts for 75,000 tons additional of Bessemer rails have been given to northern mills for delivery during the first four months of this year.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies see advertising page 24.)

Engineers' Club of Philadelphia.

A regular meeting of the club will be held Saturday evening, January 7, at which a paper on "Principles and Application of Mercury Vapor Apparatus" will be presented by F. H. von Keller.

Franklin Institute.

At the meeting of the Sections on January 5, the programme included a paper on "A New Bi-Focal Lens," by Dr. J. L. Borsch, Philadelphia; also an exhibition of lantern views (Mining in Colorado and at the St. Louis Exposition), by W. W. Canby.

Central Railway Club.

The next regular meeting of this club (which will be the annual meeting), will be held January 13, at the Hotel Iroquois, Buffalo. There will be a paper on "Locomotive Counterbalancing" by I. G. Downs, of New York, and the annual dinner and entertainment will be held in the evening. Under a new rule members are given ten days after a meeting in which to send to the secretary in writing their views upon any subject which may have been under discussion.

American Society of Civil Engineers.

At the regular business meeting of this society in New York, January 4, ballots for membership were canvassed, and a paper was presented on "Methods of Location on the Choctaw, Oklahoma & Gulf Railroad," by F. Lavis, A. M. A. S. C. E. This paper was printed in the "Proceedings" for December and is given in part elsewhere in this issue.

PERSONAL.

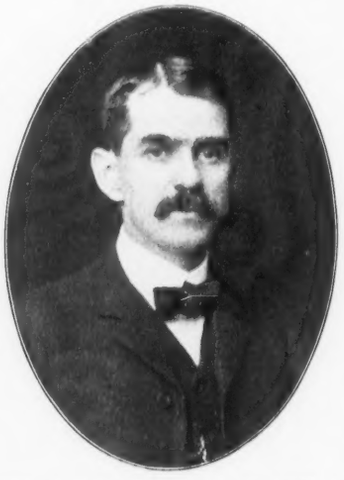
—General William Barclay Parsons, member of the Isthmian Canal Commission and late Chief Engineer of the New York City Rapid Transit Commission, has been appointed Consulting Engineer of the New York, Westchester & Boston, which proposes to build a railroad from Manhattan (New York) northeastward to the Connecticut line. Mr. William A. Pratt, until recently Chief Engineer of the Staten Island Rapid Transit, has been appointed Chief Engineer of the new line.

—Mr. Earl Hopkins Fitzhugh, who goes from St. Albans, Vt., to Montreal, Que., as Third Vice-President with general supervision over all departments of the Grand Trunk, to succeed Mr. Frank W. Morse, was

born in Danville, Mo., 52 years ago. Mr. Fitzhugh has been connected with railroad work for many years, having entered the car department of the St. Louis, Kansas City & Northern at St. Louis in 1872. In 1879, when the road was absorbed by the Wabash, he was made chief clerk in the office of the General Superintendent. In 1889 he was appointed Master of Transportation at Moberly, Mo., but resigned six years later to go to the Grand Trunk with Mr. Hays, and for a few months acted as his secretary. In 1896, Mr. Fitzhugh was appointed Superintendent of the Middle Division of the Grand Trunk, with office at Toronto. Three years later he was elected a director of the Central Vermont and was subsequently chosen Vice-President and General Manager of that road, and served until 1901. In that year he resigned to go to the Southern Pacific as Assistant to the President, but in the February following he returned east and took his old place on the Central Vermont from which he now returns to Montreal.

—Press despatches from Albany, N. Y., say that Mr. Nicholas Van Vranken Franchot, of Olean, has been appointed State Superintendent of Public Works, to succeed Mr. Charles S. Boyd. Mr. Franchot was born in Morris, Otsego County, 48 years ago. He attended Union College, of which he is now a trustee. Mr. Franchot has twice been Mayor of Olean and is largely interested in oil fields in Pennsylvania. In 1899 he was appointed a member of the New York State Commission of the Pan-American Exposition, held in Buffalo in 1901.

—Mr. P. E. Crowley, the new Assistant General Superintendent of the New York Central & Hudson River at Syracuse, is about 41 years old. Mr. Crowley began his



railroad service on the Erie in 1878 as a telegraph operator, and remained with that company until 1889 as operator, station agent and train despatcher. In March, of the latter year, he went to the Rome, Watertown & Ogdensburg as train despatcher, and when the line was leased to the New York Central, in 1890, he was appointed Chief Despatcher and later Trainmaster. In 1900, he was transferred to the Pennsylvania Division as Chief Trainmaster, and the following year was promoted to be Superintendent of that division, which position he filled until December 26, last.

—Mr. F. H. McGuigan, promoted from the Managership of the Grand Trunk to the new position of Fourth Vice-President, is a native of Cleveland, Ohio, having been born in that city in 1850. Mr. McGuigan began work as a water boy on the Erie & Pitts-

burg Division of the Pennsylvania at the age of 13. For the next 17 years he held various positions on that road, and in 1880, resigned to go to the Wabash as foreman. Here he was for five years, from 1880, division roadmaster. He was then for three years in charge of the lines west of the Mississippi River, and in 1888 was promoted to be Superintendent of the Western Division

at Kansas City. In 1896 he left that company and went to the Grand Trunk as General Superintendent, later being chosen Manager, from which position he is now promoted to the Fourth Vice-Presidency, in charge of the Maintenance and Transportation Departments.

—Judge Killam, of the Supreme Court of Canada, has been appointed to the position of Chairman of the Railway Commission left vacant by the retirement several weeks ago of Commissioner A. G. Blair. Mr. Killam was for some time Chief Justice of the Province of Manitoba.

—Mr. Joseph W. Blabon, Freight Traffic Manager of the Chicago & Alton at Chicago, was born at Farmington, Me., in 1858, and has been in railroad service for the past 14 years. He began as Purchasing Agent of the Great Northern in 1891. In 1898 he visited the Orient, in the interest of the company, and the following January was appointed Western Traffic Manager at Seattle, Wash. Mr. Blabon had charge of the traffic west of Montana. In 1902 he was elected Fourth Vice-President of the Great Northern, from which position he now resigns to go to Chicago as Freight Traffic Manager of the Chicago & Alton.

—Mr. Lewis M. Hamilton, for several years General Manager of the Cumberland & Pennsylvania, died on December 24, at the age of 54. Mr. Hamilton had been in railroad service most of his life, starting as a civil engineer on the Baltimore & Ohio. He was for a time on the Long Island, acting as paymaster. In 1882 he was appointed Assistant Engineer of the Cumberland & Pennsylvania, and was successively roadmaster, Assistant Superintendent, Superintendent, General Superintendent, and 1896 was promoted to be General Managgr, from which position, on account of ill health, he recently resigned.

—Mr. Samuel E. Crance, formerly and for many years General Superintendent of the Kansas City, St. Joseph & Council Bluffs, died at Brookfield, Mo., on December 27. Mr. Crance was born in Schoharie County, New York, in 1837, and began his railroad service on the Chicago, Burlington & Quincy as a freight brakeman. He filled successively the positions of conductor, general yardmaster at Chicago, trainmaster of the Chicago Division and Superintendent of the St. Louis Division. In 1884 he was made Superintendent of the Hannibal & St. Joseph, and in 1891, General Superintendent of the Kansas City, St. Joseph & Council Bluffs and of the Western Division of the Hannibal & St. Joseph. About two years ago Mr. Crance resigned from active work.

ELECTIONS AND APPOINTMENTS.

Atlantic Coast Line.—G. B. Huske has been appointed Assistant Engineer of Roadway, succeeding W. G. Forlong, who has been assigned to other duties.

Boston & Maine.—The Union Station and Boston Passenger and Freight Terminals, including that portion of the Western Division west of the new Metropolitan Park Bridge, Medford; the Eastern Division west of and including Mystic River Bridge and west of Curtis Street, East Boston; the Southern Division south of Gilman's Bridge and the Fitchburg Division east of Prospect Street Bridge, are to be known as the Terminal Division, and G. H. Folger has been appointed Superintendent, with headquarters in the Union Station. J. D. Tyter and C. L. Gilpatrick have been appointed Assistant Superintendents.

Chicago, St. Paul, Minneapolis & Omaha.—Thomas W. Kennedy, hitherto Assistant Superintendent at St. James, Minn., has been appointed Superintendent of the Nebraska Division, with headquarters at Omaha, succeeding S. G. Strickland. Frank E. Nicoles, hitherto Assistant Superintendent at Itasca, Wis., has been appointed Assistant Superintendent of the Minnesota & Iowa Division, succeeding Mr. Kennedy, and Elliott E. Nash has been appointed Assistant Superintendent of the Wisconsin Division, succeeding Mr. Nicoles.

Central Vermont.—G. C. Jones, Superintendent of the Middle Division of the Grand Trunk, has been appointed General Manager of the C. V. E. H. Fitzhugh, Vice-President and General Manager, has resigned. (See Grand Trunk.)

Delaware, Lackawanna & Western.—William Linn has been appointed Assistant Terminal and Lighterage Agent, with office at Hoboken, N. J.

Grand Trunk.—E. H. Fitzhugh, hitherto Vice-President and General Manager of the Central Vermont, has been appointed Third Vice-President of the G. T., succeeding Frank W. Morse, who has resigned to become Vice-President and General Manager of the Grand Trunk Pacific. F. H. McGuigan, hitherto Manager, has been appointed Fourth Vice-President. W. G. Brownlee, hitherto Superintendent of the Western Division, has been appointed Superintendent of the Middle Division, with headquarters at Toronto, Ont., succeeding G. C. Jones, resigned. F. W. Egan, hitherto Assistant Superintendent at Island Pond, Vt., has been appointed Superintendent of the Western Division, with headquarters at Detroit, Mich., succeeding Mr. Brownlee; and Mr. Egan in turn is succeeded by C. L. Mayne. (See Central Vermont.)

Grand Trunk Pacific.—See Grand Trunk.

Illinois Central.—H. McCourt, hitherto Assistant General Superintendent, has been appointed General Superintendent of Transportation, succeeding D. W. Ross, resigned, to engage in business in the south. E. H. Hariman, hitherto Superintendent at Chicago, has been appointed to succeed Mr. McCourt.

W. M. Rhett, General Freight Agent at New Orleans, La., has been transferred to Chicago. R. C. Perkins has been appointed to succeed Mr. Rhett.

Louisville & Nashville.—C. D. Boyd, Assistant General Freight Agent, has been transferred to Knoxville, with the title of Freight Agent of the Atlanta-Cincinnati line of the L. & N.

Maricopa, & Phoenix & Salt River Valley.—W. F. Ingram has been appointed Auditor, with headquarters at Tucson, Ariz.

Missouri Pacific.—J. P. Young has been appointed Master Car Builder, with headquarters at St. Louis, Mo.

W. L. Kellogg, Division Master Mechanic, has resigned. (See Pere Marquette.)

New York, New Haven & Hartford.—J. A. Droege has been appointed Superintendent of the Worcester Division, succeeding A. R. Whaley.

Northern Pacific.—C. R. Claghorn has been appointed General Manager of the coal department.

Pennsylvania.—Louis H. Barker, hitherto Principal Assistant Engineer of the United Railroad of New Jersey at Jersey City, N. J., has been appointed to the newly created position of Assistant Chief Engineer of the Pennsylvania, with headquarters at Philadelphia, Pa. E. B. Temple has been appointed Assistant to the Chief Engineer.

Pere Marquette.—W. L. Kellogg, hitherto Master Mechanic of the Missouri Pacific at Ft. Scott, Kan., has been appointed Master Mechanic of the P. M., in charge of Motive Power and Equipment, with headquarters at Grand Rapids, Mich., succeeding W. K. Christie, assigned to other duties.

Rome, Watertown & Ogdensburg.—Edwin Parsons has been elected President.

San Pedro, Los Angeles & Salt Lake.—I. T. Dyer has been appointed Superintendent of Telegraph, with office at Los Angeles, Cal. H. W. Henderson, Superintendent at Salt Lake City, has resigned.

Southern.—J. F. Sheahan, Master Mechanic at Columbia, S. C., has been appointed Master Mechanic at Spencer, N. C., succeeding S. R. Richards, resigned.

Southern Indiana.—J. W. Thompson has been appointed General Manager, with headquarters at Terre Haute, Ind. The office of General Superintendent, heretofore held by Mr. Thompson, has been abolished.

Wabash.—C. S. Crane has been appointed General Passenger Agent of the Wheeling & Lake Erie, with headquarters at St. Louis, Mo., succeeding E. B. Coolidge.

Wheeling & Lake Erie.—See Wabash.

LOCOMOTIVE BUILDING.

The Argentine Government has ordered 12 locomotives from the Baldwin Locomotive Works.

The Detroit Southern is having three locomotives built by the Baldwin Locomotive Works.

The Pittsburg & Lake Erie has ordered five locomotives from the American Locomotive Co.

The New York, New Haven & Hartford has ordered 20 switching (0-6-0) locomotives from the American Locomotive Co.

The New Mexico Railway & Coal Company has ordered 18 freight locomotives and two passenger locomotives from the Baldwin Locomotive Works.

The Toledo, Peoria & Western, as reported in our issue of December 30, has ordered five simple 10-wheel (4-6-0) locomotives from the Baldwin Locomotive Works, for October, 1905, delivery. These locomotives will weigh 139,300 lbs., with 109,600 lbs. on the drivers; cylinders, 19 in. x 26 in.; diameter of drivers,63 in.; straight boiler, with a working steam pressure of 200 lbs.; 281 tubes, 2 in. in diameter and 14 ft. 5 in. long; fire-box, 96⅝ in. long and 42 in. wide; grate area, 28 sq. ft.; tank capacity, 4,500 gallons of water, and coal capacity, 10 tons. Special equipment includes: Westinghouse air-brakes and Samson bell ringers.

The Delaware & Hudson has ordered 15 simple Consolidation (2-8-0) locomotives from the Schenectady Works of the American Locomotive Co. for January, 1905, delivery. These locomotives will weigh 193,000 lbs., with 170,000 lbs. on drivers; cylinders, 21 in. x 30 in.; diameter of drivers, 50 in.; Wooten boiler, with a working steam pressure of 200 lbs.; heating surface, 3,407.8 sq. ft.; 411 National Tube Co.'s charcoal iron tubes, 2 in. in diameter and 14 ft. 6 in. long; fire-box, 120⅜ in. long and 108¼ in. wide; great area, 90.2 sq. ft.; tank capacity, 7,500 gallons of water, and coal capacity, 12 tons. Special equipment includes: New York air-brakes, American Locomotive Co.'s standard axles, Samson bell ringers; magnesia sectional boiler lagging, Simplex brake-beams, Lappin brake-shoes, Climax couplers, Dressel headlights, Hancock composite injectors, Cyprus bronze journal bearings, U. S. metallic piston rod and valve rod packings, Star safety valves, Leach sanding devices, Nathan sight-feed lubricators, Railway Steel-Spring Co.'s springs, Ashcroft steam gages, Midvale driving-wheel tires, Taylor truck and tender-wheel tires and cast-steel wheel centers.

The Cincinnati, Hamilton & Dayton and Pere Marquette have ordered 32 simple consolidation (2-8-0) locomotives from the Brooks Works of the American Locomotive Co., and 30 simple consolidation (2-8-0) locomotives from the Baldwin Locomotive Works, all for February, March and April, 1905, delivery. All locomotives will weigh

171,000 lbs., with 151,000 lbs. on the drivers; cylinders, 19½ in. x 28 in.; diameter of drivers, 57 in.; extended wagon top boiler, with a working steam pressure of 200 lbs.; 304 National Tube Co.'s charcoal iron tubes, 2 in. in diameter and 14 ft. long; Otis steel fire-box, 96 in. long and 68 in. wide; tank capacity, 5,000 gallons of water and coal capacity, 12 tons. The special equipment for all will include: Westinghouse air-brakes, Taylor iron axles for 32 locomotives, Cook and Strong bell ringers, Philip Carey Manufacturing Co.'s boiler lagging, Simplex brake-beams, Perfecto brake-shoes, Buckeye couplers, Kelly headlights, Ohio injectors for 32 locomotives and Hancock injectors for 30 locomotives, Hewitt brasses, Jerome piston and valve-rod packings, Coale safety valves, Leach sanding devices, Detroit sight-feed lubricators, Railway Steel-Spring Co.'s springs, Crosby steam gages, Latrobe driving and truck wheel tires and Davis wheel centers.

CAR BUILDING.

The Chicago & North Western has ordered 1,000 box cars from the Pullman Co.

The United Coal Company has ordered 1,000 cars from the Standard Steel Car Co.

The Halifax & Southwestern has ordered 100 box cars and 50 flat cars from Rhodes, Curry & Co., Amherst, N. S.

The Kentucky Refining Company, Louisville, Ky., has asked prices on some tank cars.

The Wason Manufacturing Company is reported to have received an order for 25 cars for use in China.

The Northern Pacific has ordered 2,500 box cars of 80,000 lbs. capacity from the Western Steel Car & Foundry Co.

The Richmond, Fredericksburg & Potomac has ordered 20 Rodger ballast cars of 80,000 lbs. capacity from the American Car & Foundry Co.

The Central Vermont has either ordered or is about to order four passenger coaches, two parlor café cars, two baggage cars and two smoking cars.

The Queen & Crescent has placed orders for 1,000 box cars, 200 gondolas, 200 coke cars and 100 steel ore cars. This order has been divided as follows: Barney & Smith, 400 box; Mt. Vernon Car Manufacturing Co., 200 box and 200 gondolas; Western Steel Car & Foundry Co., 200 coke cars; Detroit Works of the American Car & Foundry Co., 100 steel ore cars, and St. Louis Works of American Car & Foundry Co., 400 box cars.

The Northern Pacific has ordered four tourist cars, two dining cars, two parlor cars, two passenger coaches and two combination baggage and smoking cars from Barney & Smith. The dining cars will be 72 ft. long. All the other cars will be 70 ft. long, 9 ft. 10 in. wide over sills and 14 ft. 13/16 in. high. Special equipment for all includes: Westinghouse air-brakes, Forsythe curtain fixtures, Pantasote curtain material, Symington journal boxes, Northern Pacific standard paint and standard steel platforms and Christie brake-shoes.

The New York, New Haven & Hartford order for 115 cars for passenger service will include 90 coaches, 10 smoking cars with vestibules, 10 combination baggage and smoking cars and five combination baggage and passenger cars. The specifications include Hale & Kilburn seats, Edwards window fixtures, Standard steel platforms, Chaffee centering devices, Railway Steel-Spring Co.'s springs, Pintsch gas, Diamond special brake-beams (inside hung), steel tired wheels (the make of tires to be optional with the builder) and Pantasote curtains. The vestibules will be fitted with Climax diaphragms.

The Cincinnati, Hamilton & Dayton and Pere Marquette have ordered 3,000 box cars of 60,000 lbs. capacity, and 2,000 wooden gondola cars of 80,000 lbs. capacity from the American Car & Foundry Co., for January, 1905, delivery. The box cars will weigh 34,000 lbs., and are of American Railway Association standard dimensions. Special equipment for both includes: Chicago Railway Equipment Co.'s brake-beams, Westinghouse air-brakes, Hewitt brasses, Monarch couplers, Miner draft rigging, Symington journal boxes and lids, Mamolith carbon paint, Railway Steel-Spring Co.'s springs, Player trucks and American Car & Foundry Co.'s wheels; for box cars Western Railway Equipment Co.'s doors, Symington dust guards and Winslow roofs.

The Norfolk & Western will build 200 hopper-bottom gondolas of 100,000 lbs. capacity, 200 hopper-bottom gondolas of 80,000 lbs. capacity and 25 cabooses at their own shops. The 100,000 gondolas will weigh 38,000 lbs. and will be 31 ft. long and 9 ft. 2 in. wide over body and 10 ft. ½ in. high above rail. The 80,000 gondolas will weigh 34,500 lbs. and will be 27 ft. 9½ in. long and 9 ft. 2 in. wide over body and 9 ft. 6⅜ in. high above rail. The cabooses will weigh 17,100 lbs. and will be 19 ft. 9¾ in. long over eaves, 8 ft. 1¾ in. wide over body and 14 ft. 10¼ in. high over all. Special equipment includes: Christie brake-shoes, Westinghouse air-brakes for gondolas, Ajax brasses, Butler draft rigging, Pressed Steel journal box lids for cabooses, Barber roller side-bearing trucks for gondolas and National Malleable Castings Co.'s journal boxes.

BRIDGE BUILDING.

ALBANY, N. Y.—The contract for bridges on the West Shore between this place and Buffalo has been given to the Riter-Conely Manufacturing Co., of Pittsburg, Pa. The contract calls for about 12,000 tons of structural steel.

BATON ROUGE, LA.—According to reports, the Southern Pacific is planning to build a bridge over the Mississippi river for the joint use of that road and the Gould lines, Frisco system and the Missouri, Kansas & Texas road.

BENWOOD, W. VA.—The City Railway Co. of Wheeling is planning to build a bridge across the Ohio river.

COLORADO SPRINGS, COLO.—The Atchison, Topeka & Santa Fe, it is reported, will make improvements, including the building of new bridges at Costilla and Kiowa streets. Plans for the latter have been made by the City Engineer.

FARIBAULT, MINN.—The Chicago Great Western may soon build a bridge over its tracks at Eighth street.

GODERICH, ONT.—Bids will soon be asked for a bridge over the Sauble River between the townships of Bosanquet and Stephen.—The Road and Bridge Committee of the County Council recommends that the following bridges be built in 1905, according to the engineer's report, and that bids be called for and contracts let at the coming meeting of the Council in January: At Ashfield, south of Amberley, over Eighteen Mile River, on the lake shore, to be 95 ft. long and 16 ft. wide; on the boundary between Ashfield and West Wawanosh over the Nine Mile River, to be 60 ft. long and 16 ft. wide; over the Maitland River between Morris and Turnberry, 110 ft. long and 16 ft. wide; two bridges on the boundary between Tuckersmith and Hibbert one over the Bayfield River, 60 ft. long and 16 ft. wide and the other over Morrison's Creek between Huron and Perth.

JOPLIN, MO.—The Kansas City Southern, it is reported, will at once begin work on a viaduct over its tracks at North Main street.

KELSO, WASH.—A project is under foot to build a bridge 900 ft. long, with an 80-ft. draw, over Cowlitz River.

LYON FALLS, N. Y.—Petition will be made to the State Legislature to appropriate $30,000 for building an iron bridge over the junction of the Black and Moose rivers.

MANISTEE, MICH.—The Board of Supervisors has turned over to the county the building of the new bridge, for which $30,000 of bonds authorized at a recent election will be issued. The bridge is to be completed by June 1 next.

MARION, IND.—The bridge over the Mississinewa River, at Washington street, it is reported, will be rebuilt.

MIDDLETOWN, OHIO.—Residents are petitioning the County Commissioners to build a new bridge over the Miami River at West Sixth street.

MONTREAL, QUE.—Application will be made next session for an act authorizing the Montreal Bridge Company to buy the property, rights and franchises of the Montreal & Longueuil Bridge Company, or to amalgamate with said company; to authorize a change in the proposed site of the bridge and to fix a date for its completion.

NEW YORK, N. Y.—Plans have been made by Commissioner Best for lengthening the train platforms of the Brooklyn Bridge, extending the present train shed over Park Row and adding two new platforms, each 340 ft. long, at a cost of about $300,000.

The bids opened by Bridge Commissioner Best for the Manhattan and Brooklyn anchorages of the Manhattan bridge were: For the Manhattan anchorage: Williams Engineering Co., $1,197,000; Naughton & Co., $1,296,000; R. H. Hood Co., $1,687,460; J. C. Rogers, $1,409,000, and J. J. Hopper, $1,396,140. For the Brooklyn anchorage: Williams Engineering Co., $1,237,000; Naughton & Co., $1,282,000; R. H. Hood Co., $1,511,884; Ryan & Parker, $1,393,000; J. J. Hopper, $1,337,000, and the Kosmos Engineering Co., of Brooklyn, the lowest bidder, was awarded the contract at its bid of $1,212,554.

PORTLAND, ORE.—Plans are being made for rebuilding the bridge on Grand avenue; also the one on Williams avenue, as both are in a dangerous condition and must be repaired.

RACINE, WIS.—Plans are being made for building a bascule bridge at Main street to cost about $80,000, for which $65,000 has been appropriated.

SHAMOKIN, PA.—The County Commissioners, at a recent meeting, it is reported, decided to replace the bridge between Packers Island and Northumberland with an iron structure.

WASHINGTON, D. C.—A bill has been introduced in the Lower House of Congress providing for the building of a bridge over Rock creek at Q street, northwest, in accordance with plans prepared by the Commissioners with the approval of the Secretary of War.

Other Structures.

ATLANTIC CITY, N. J.—According to local newspaper reports, the Pennsylvania will put up a new roundhouse.

BRUNSWICK, GA.—The Atlanta & Birmingham, local reports state, will put up a new passenger station.

CHALMETTE, LA.—A contract, it is reported, has been given to James Stewart & Co., contractors, with offices at St. Louis, Pittsburg and New York, at $2,000,000 for building the ship docks and terminals at this place for the Southern Railway and the St. Louis & San Francisco.

CINCINNATI, OHIO.—The Louisville & Nashville, it is reported, is asking bids for putting up a large warehouse in its yards at the corner of Front and Butler streets.

DES MOINES, IOWA.—Residents of the east side of the Des Moines River in this city have requested the Des Moines Union to replace the present station with a new brick building, and have also petitioned the Rock Island to reopen the depot in East Des Moines and build a new brick one during the coming year.

FRANKLIN, PA.—The Pennsylvania, it is reported, has bought a large plot of ground near this place, which is on the Buffalo & Allegheny Valley division, as a site for repair shops and yards.

LOS ANGELES, CAL.—Plans are being made by Architect S. Tilden Norton for a number of freight houses to be built in Mexico on the Pan-American Railroad. They will be of brick 40 x 95 ft.

MCKINNEY, TEX.—The Houston & Texas Central, it is reported, and the Missouri, Kansas & Texas will jointly build a new passenger station, for which plans are ready.

MADISON, N. J.—The Delaware, Lackawanna & Western, reports say, has bought a site on which it will put up a new passenger station.

OWOSSO, MICH.—Reports state that the Grand Trunk will build a $35,000 station here.

SOUTH MCALESTER, IND. T.—The Missouri, Kansas & Texas is reported having given a contract to Adam Bauer, of St. Louis, for building the union passenger station here at $39,000, to replace the structure destroyed about two years ago.

SPENCER, N. C.—The Southern Railway, according to local reports, will contribute $15,000 and provide a site towards the new Y. M. C. A. building to be built here.

STAUNTON, VA.—The Chesapeake & Ohio, reports say, has plans ready for putting up a new station here.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

AMADOR RAILROAD.—This company has been incorporated in Delaware with a capital of $1,000,000 to build a railroad from a point on the Cœur d'Alene branch of the Northern Pacific in Montana to the Amador mine. The directors include: Erasmus B. Waples, of Wilmington, Del., and William Surlin, of Carlinville, Ill.

ATCHISON, TOPEKA & SANTA FE.—Grading has been begun on the extension of this road from Owasso, Ind. T., south to Tulsa, 12 miles. Robert Kinkaid, of Tulsa, is the contractor. The present southern terminus of the A., T. & S. F. is Owasso (December 9, p. 186.)

Press reports state that this company will begin work on a second track west from Chicago early in the spring. The Santa Fe already operates seven miles of double track at the Chicago end. This double track will be extended to Joliet.

ATCHISON, TOPEKA & SANTA FE (COAST LINES).—A contract has been let to the Lantry-Sharp Contracting Co., Kansas City, Mo., for the work necessary to change the location of the line through Truxton Canon, Ariz. The total contract for grading and masonry will amount to about $200,000. The change is made to insure immunity from floods.

BAY MINETTE & FORT MORGAN.—Grading is reported about 70 per cent. completed on this road, which is being built from Bay Minette, Ala., south to Foley, 37 miles. The work is light, with a maximum grade of 1 per cent. and a maximum curvature of 4 degrees. Track laying will shortly be begun. W. W. Olney, Bay Minette, Ala., is Chief Engineer. (October 21, p. 133.)

BROOKHAVEN & PEARL RIVER.—This company has been incorporated in Mississippi to build a railroad from Brookhaven, Miss., southeast to a point on Pearl River, about 20 miles. S. E. Morton, S. J. Carpenter, D. J. Batchelder, Jr., and others, of Brookhaven, are incorporators.

CHICAGO, ANAMOSA & NORTHERN.—This line has been opened for traffic between Anamosa, Iowa, and Prairiesburg, 20 miles. Grading has been finished for a distance of 10 miles north of Prairiesburg and track laying on this portion is now in progress. The Midland Construction Co., of Dubuque, Iowa, is doing the grading and masonry work. It is expected to have the line finished as far as Quasqueton, Buchanan County, before the end of 1905. The line will eventually be extended to Waterloo. Henry Kiene, Dubuque, Iowa, is President, and J. F. Lacord, Anamosa, Iowa, is Chief Engineer. (December 2, p. 177.)

CHICAGO & SOUTHWESTERN TRACTION.—This company has been incorporated in Illinois to build an electric road from Morris, Grundy County, north to Yorkville, Kendall County, 20 miles. The capital stock is $400,000, and the incorporators, who are also the first board of directors, are: William T. Kopf, Frederick W. Hill and Horace W. Nichols, Jr., all of Chicago.

FLINT RIVER & GULF.—This is a new line now building from Carlisle, Ga., northeast via Sylvester to Ashburn, 20 miles. Twelve miles are graded and the rails laid on seven miles. This road will connect with the Georgia Northern at Carlisle, the Atlantic Coast Line at Sylvester and the Georgia Southern & Florida at Ashburn. C. A. Alford, of Willingham, Ga., is General Manager.

GRANITE CITY, ST. LOUIS & EASTERN (ELECTRIC).—Incorporation has been granted this company in Illinois to build a belt railroad in and about Granite City. F. G. Niedringhaus, St. Louis, Mo., and W. W. Hanlon and C. F. Stelzel, of Granite City, Ill., are among the incorporators.

GREAT NORTHERN.—It is announced semi-officially that this company will begin work in 1905 on a branch from Ephrata, Wash., north through Waterville, about 75 miles.

IONE & EASTERN.—This road has been finished from Ione, Cal., to Mountain Springs, 6½ miles. Work is now in progress on an extension from the latter point through Martels to Amador, 13 miles. H. E. C. Feusier, Ione, Cal., is Chief Engineer. (September 2, p. 79.)

KANSAS CITY, TULSA & SOUTHWESTERN.—An officer writes that the proposed route of this road is from a point in Kansas near Chetopa to Wichita Falls, Tex., passing through Tulsa, Ind. T., and Shawnee, Okla. T. Surveys have been finished for about 100 miles. The maximum grade will be .6 per cent., and the maximum curvature, 3 degrees. The work will include six steel bridges. Grading will be begun on the northern end within 60 days. Jay Forsythe, Tulsa, Ind. T., is President, and W. H. Hendren, General Manager and Chief Engineer. (November 25, p. 169.)

LUFKIN, BATSON & BEAUMONT.—This company has been organized in Texas to build a railroad from Lufkin south through Angelina, Polk, Hardin, Liberty and Chambers counties. Edward Kennedy, Beaumont, Tex., is said to be interested.

LAKE SHORE & MICHIGAN SOUTHERN.—It is announced that the new branch from Elyria, Ohio, north to Lorain, eight miles, will be in operation early this month. This is to connect with the new tube mill of the United States Steel Corporation at Lorain.

LITTLE ROCK & MONROE.—Press reports state that this road, which is being built from Felsenthal, Ark., to Monroe, La., 45 miles, has been finished to the Ouachita River, 31 miles. The remainder of the road has been graded and it is expected that the entire line will be opened for traffic about February 1. C. D. Johnson, Equitable Building, St. Louis, Mo., may be addressed.

NEW YORK, PENNSYLVANIA & SOUTHWESTERN.—A sub-contract for grading 15 miles of this road from Wyalusing, N. Y., northeast has been let by the original contractors, the Colonial Construction Co., to Allen, Donnelly & Co., of Easton, Pa. The road is being built from Williamsport, Pa., northeast to Binghamton, N. Y., 116 miles. D. E. Baxter, 299 Broadway, N. Y., is General Manager, and A. K. Harvey, Binghamton, N. Y., is Chief Engineer. (December 2, p. 177.)

NORTHWESTERN RAILROAD.—A charter has been granted to this company in Oklahoma Territory to build from Elk City through Day, Woodward and Beaver counties, with a branch to the south fork of the Red River. The incorporators are E. C. Neiss, L. N. Neiss, E. F. Krause, A. F. Colgren, of Chicago, and W. F. Pierce, of Elk City, Okla. Ter.

RALEIGH & WESTERN.—This company has graded 15 miles of its line west from Cumnock, N. C., to Harpers. Location surveys have been finished as far as Winston. The road runs at present between Colon and Randleman, 56 miles, with a branch line from Colon to Cumnock, eight miles. S. A. Henszey, 52 Broadway, New York, is President.

ST. LOUIS, BROWNSVILLE & MEXICO.—The Hidalgo branch, running from Harlingen, Tex., on the main line 25 miles north of Brownsville, to Fordyce, 55 miles, has been opened for traffic. Grading is now in progress on an extension from Robstown, Tex., to Bay City, 150 miles. W. P. Homan, Corpus Christi, Tex., is Chief Engineer. (December 9, p. 187.)

SANTA CLARA INTERURBAN.—This company has been incorporated in California with an authorized capital of $5,000,000 to build an electric railroad from San Mateo southeast to San Jose in Santa Clara County, 30 miles. E. M. Rea, San Jose; F. D. Dorman, Palo Alto, and J. C. Campbell, San Francisco, are among the incorporators. The new line will parallel the Southern Pacific.

SEABOARD AIR LINE.—Press reports state that this company is planning to extend its Durham branch to Greensboro, N. C., and probably to Mt. Airy.

WABASH.—It is reported that this company is planning to build the following lines next year: A line from Lisbon, Ohio, west to Minerva, 20 miles; north to Washingtonville, 10 miles, to provide an outlet for the Salem branch of the Pittsburg, Lisbon & Western Railroad; from Negley southwest to the Ohio River at Wellsville and East Liverpool, 10 miles, and from New Galilee, Pa., northeast to Ellwood City, six miles, and northeast to Newcastle, 20 miles. In addition, nearly $400,000 will be spent for an entrance into Youngstown, Ohio.

RAILROAD CORPORATION NEWS.

ATLANTIC & LAKE SUPERIOR.—A meeting of the stockholders will be held in Montreal on January 23 to consider terms of settlement in connection with the purchase of the Baie des Chaleurs, Ottawa Valley and Great Eastern railroads.

BALLSTON TERMINAL.—This road has been purchasd by A. S. Chandler, of Philadelphia, and T. F. Barrett, of Saratoga Springs, N. Y., for $175,000. The purchasers represent the bondholders' committee and the road is to be reorganized under the title of the Eastern New York. The Ballston Terminal Railroad is an electric line connecting Ballston Spa with Middle Grove, N. Y., 11 miles.

CHICAGO, ROCK ISLAND & PACIFIC.—Cash has been deposited with the Central Trust Co., of New York, to provide for the redemption of $2,250,000 6 per cent. notes of John Scullin and $2,250,000 6 per cent. notes of David R. Francis due January 1, 1905, and secured by all the stock and bonds of the St. Louis, Kansas City & Colorado Railroad. As soon as these notes are paid, the collateral will be cancelled and the new refunding mortgage of the C., R. I. & P. will become a direct lien on the mileage of the St. Louis, Kansas City & Colorado, amounting to 254.6 miles of track between St. Louis and Strasburg Junction, Mo.

CHICAGO TERMINAL TRANSFER.—It is announced that the Guarantee Trust Co., of New York, will purchase any or all of the coupons of this company due on or before January 1, 1905. This is said to be the first step in a reorganization of the finances of the company.

CINCINNATI, HAMILTON & DAYTON.—A special meeting of the stockholders of this com-

pany has been called for January 12 in Cincinnati. The following propositions will be voted on: To authorize the outright lease of the Pere Marquette and all its properties; to ratify the purchase of 110,000 shares of Pere Marquette stock, the traffic agreement dated July 1, 1904, and the purchase of $6,000,000 Pere Marquette refunding bonds recently resold to Redmond & Co.; to authorize the lease of the Chicago, Cincinnati & Louisville, and the guarantee of the bonds issued by the Pere Marquette for the purchase of this line; to authorize an issue of $50,000,000 4 per cent. 50-year general-mortgage bonds to retire $25,000,000 refunding bonds authorized last summer, and for other general purposes.

Consolidated Railway.—This company, operating the electric lines belonging to the New York, New Haven & Hartford, has bought the New York & Stamford Street Railroad and the Greenwich Tramway, for a sum said to have been about $1,400,000. These two roads control 18 miles of electric line from New Rochelle, N. Y., to Stamford, Conn., with a branch to Rye Beach.

Des Moines & Fort Dodge.—This line, which was turned over to the Minneapolis & St. Louis by the Rock Island on December 31, is a part of the first railroad in Central Iowa. It was projected in 1853 by the Keokuk, Fort Des Moines & Minnesota Railroad Company. In 1854 the name was changed to the Des Moines Valley and construction was started at Keokuk. It reached Eddyville in 1861, but was not completed to Des Moines until in 1866. Soon thereafter the line was extended to Fort Dodge. The grasshoppers ruined the crops along the line for several years in succession, and the road was sold at auction in 1873. The line was divided at Des Moines, the southern section being known as the Keokuk & Des Moines and the northern section as the Des Moines & Fort Dodge. The K. & D. M. passed into the hands of the Rock Island in 1878. The Des Moines & Fort Dodge was operated independently for a time, the new owners having in view the extension of the line into Minnesota to connect with the Pacific Coast lines. Their finances failed, however, and in 1885 a twenty year lease was given to the Rock Island. The Rock Island purchased the securities, planning to secure title to the road. This plan was frustrated by Edwin H. Hooley, who secured a majority of the stock about two years ago. After Mr. Hooley's failure in 1903, the Minneapolis & St. Louis secured his interest in the road, and now has assumed control.

Great Northern (Canada).—Notice is given to the holders of series A and series B bonds that an offer has been made for the purchase of these bonds which has been accepted by the reorganization committee. Dissenting bondholders may withdraw the deposited bonds until the close of business, January 18, 1905, upon payment to the Central Trust Co., of New York, of the sum of $5 for each bond withdrawn. The reorganization plan as announced consists in the issue of $7,962,000 new 4 per cent. 30-year gold bonds. Of this amount, $4,662,000 will be issued to refund the existing series A and series B bonds and $300,000 will be used to refund the terminal and postal bonds. The remaining $3,000,000 will be issued to pay for branches and lines hereafter acquired or constructed. These latter bonds may be issued up to $20,000 per mile.

Mexican Central.—This company has purchased from the Mexican National Construction Co. the railroad line running from Colima, Mex., to Manzanillo. The Mexican Central will resume work on the extension from Colima to Tuxpan, which is already partly graded.

Muscatine North & South.—This road, which extends from Muscatine, Iowa, south to Elrick Junction, 29 miles, was sold at foreclosure proceedings on December 15. The road was bid in for $104,000 by Henry Jayne, who represented the bondholders.

New York & Port Chester.—The New York Railroad & Development Co. has been incorporated in New Jersey, with an authorized capital of $1,500,000, to build the proposed New York & Port Chester (Electric) Railroad from the Harlem River, New York City, northeast through the Borough of the Bronx to Pelham, New Rochelle, Larchmont & Port Chester, a total distance of about 25 miles. The directors include: Edwin Gould, C. W. Morse, George R. Sheldon, W. C. Gotshall and others.

Orange & Northwestern.—*The Commercial & Financial Chronicle* says that B. F. Yoakum, Chairman of the Board of Directors of the St. Louis & San Francisco, has recently arranged to purchase a large block of this company's capital stock, including, it is supposed, a majority of an issue of which the total authorized amount is $400,000. The road extends from Buna, Tex., to Orange, 30 miles, and connects with the Atchison, Topeka & Santa Fe, the Southern Pacific and the Kansas City Southern. Extensions aggregating 385 miles have been projected, including one to Shreveport, La., 150 miles. Some of these extensions, it is understood, will be placed under construction in the near future.

Pennsylvania Company.—At a meeting of the directors of this company on December 28, an annual dividend of 5 per cent. for the year 1904 was declared. This dividend is payable on December 31 to stockholders of record December 2, and is an increase of 1 per cent. As the $40,000,000 stock of the Pennsylvania Company is owned by the Pennsylvania Railroad, the increase in dividend will benefit the latter company to the amount of $400,000 annually. No dividends were paid on this stock between the years 1895 and 1900. In 1901 and 1902, dividends of 3 per cent were paid, and in 1903 the dividend was 4 per cent.

Pere Marquette.—At a special meeting of the stockholders of this company, an issue of $60,000,000 4 per cent. 50-year gold bonds was authorized. Of this amount, $5,051,000 may be issued at once, $13,175,000 is reserved for extensions, second-track work and various betterment expenditures and $46,774,000 is for the retirement of a like amount of existing bonds.

Reading Company.—For the month of November, 1904, gross earnings of this company were $3,135,858, an increase of $376,647 over the same month in 1903. Operating expenses were $1,454,188, a decrease of $248,020, leaving an increase in net earnings for the month of $624,667. Net earnings of the Coal & Iron Company in November were $317,841, an increase of $159,353. Total net earnings for all companies for the month were $2,119,583, an increase of $784,020. For the five months dating from July 1, net earnings for all companies were $8,583,741, an increase of $925,393 over the same period in 1903.

Seaboard Air Line.—The report of this company for the fiscal year ending June 30, 1904, shows an increase in gross earnings of $604,881. Operating expenses increased $715,192, leaving a decrease in net for the year of $110,311. The surplus over all fixed charges amounted to $382,825, a decrease of $449,656 over 1903.

Texas & Gulf.—It is announced that the Texas & Gulf, the Sabine Valley & Northwestern and the Marshall, Timpson & Sabine Pass railroads have been consolidated. G. M. D. Grigsby, Longview, Tex., is President and General Manager.

Vandalia.—A circular announces the merger of the following roads into one company, to be called the Vandalia Railroad: Terre Haute & Indianapolis; St. Louis, Vandalia & Terre Haute; Terre Haute & Logansport; Logansport & Toledo; Indianapolis & Vincennes.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

Published Every Friday by
THE RAILROAD GAZETTE
At 83 Fulton St., New York.

EDITORIAL ANNOUNCEMENTS:

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages and all of the advertisement pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name, Transport and Railroad Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

FRIDAY, JANUARY 6, 1905.

CONTENTS

EDITORIAL:
An Interstate Commerce Court 1
Automatic Block Signaling; Single Track 1
The Outlook for 1905..... 2
A Phase of Eminent Domain 3
Northern Securities Injunction Dissolved. 4
Editorial Notes 4, 5
New Publications 5
Trade Catalogues 5

ILLUSTRATED:
Proposed Union Station for Buffalo..... 6
New Automatic Block Signals on the Lackawanna 8
Rails for Lines with Fast Trains..... 9
Method of Location; Choctaw, O. & G. 11
A Variable Exhaust and Drifting Device. 15
Tractive Resistance, Loaded R'y Wagons 15
W. H. Baldwin, Jr..... 18
N. Y., O. & W. Turntable with Air Motor 19
Railroad Shop Tools..... 20
Small Railroad Stations..... 24

CONTRIBUTIONS:
Accident Record—Correction. 5
Accident to Trespassers..... 5

MISCELLANEOUS:
Foreign Railroad Notes 7
The Passenger Department 16
Automatic Block Signal Rules; Mo. Pac. 19
B. & O. Relief Department..... 21
Railroad Provident Institutions..... 22

GENERAL NEWS SECTION:
The Scrap Heap 1
Meetings and Announcements 4
Personal 4
Elections and Appointments..... 5
Locomotive Building 5
Car Building 6
Bridge Building 6
Railroad Construction 7
Railroad Corporation News..... 7